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The free and open exchange of knowledge both stimulates and provides quality control for the progress of science. This report provides information on the research which EPA is planning for this fiscal year, on how much we intend to spend on each program area, and on whom to contact for further details. More than 60 percent of our research budget will be spent through extramural contracts, grants, and cooperative agreements with organizations outside of EPA's laboratories.

It is our intent to increase the efficiency and effectiveness of this research by placing great emphasis upon open competition for extramural support. We hope that the information in this report will stimulate qualified parties and make their capabilities known to our research managers so that we all might gain from sharing experience and expertise.

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FY-1988 EPA Research Program Guide

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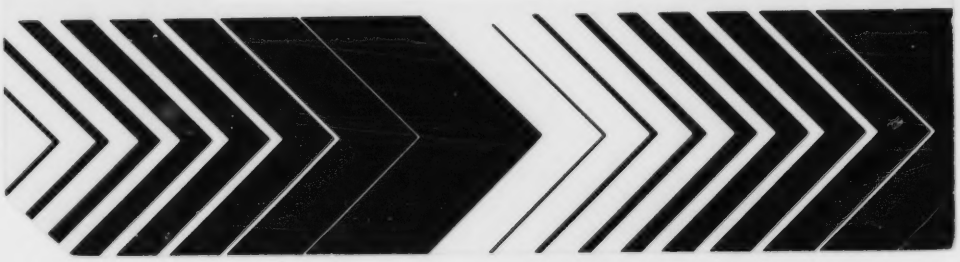

Notice

The program descriptions and resource estimates included in this document reflect the latest detailed information available at time of publication. Time and pending Congressional actions will change some of this information. In addition, the resource figures have been rounded off and some smaller programs omitted. For the latest information, you may want to contact the individual listed.

EPA/600/9-87/021
September 1987

FY-1988 EPA Research Program Guide

October 1, 1987 — September 30, 1988

Office of Research and Development
U.S. Environmental Protection Agency
Washington, DC 20460

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Introduction

The free and open exchange of knowledge both stimulates and provides quality control for the progress of science. This report provides information on the research which EPA is planning for this fiscal year, on how much we intend to spend on each program area, and on whom to contact for further details. More than 60 percent of our research budget will be spent through extramural contracts, grants, and cooperative agreements with organizations outside of EPA's laboratories.

It is our intent to increase the efficiency and effectiveness of this research by placing great emphasis upon open competition for extramural support. We hope that the information in this report will stimulate qualified parties and make their capabilities known to our research managers so that we all might gain from sharing experience and expertise. Please feel free to contact any of the parties listed in this report.

How to Use the Program Guide

The following descriptions of ORD's research program are organized first by media such as air, water, hazardous wastes, etc. These categories are further broken down into research foci such as scientific assessment, monitoring and quality assurance, health effects, environmental processes, and engineering technology. Each description is a very broad summary of the research being done, where that research is being done, who to contact for more information about the program, and both the approximate total funding for that area and the percentage of total funding which is reserved by EPA for in-house research. Funding which is not reserved for in-house research is spent through extramural contracts, grants and cooperative agreements.

For each program description, one or more contacts are listed along with the major research areas to be pursued. For further information, you may call the contacts. Their commercial and Federal (FTS) telephone numbers are listed in a separate section near the end of this report. Where two or more research laboratories are listed, please turn to the "EPA R&D Organization" section of this report for descriptions of the major mission and functions of each.

Some of the research funded for this fiscal year will be done in-house by EPA's laboratories. The rest will be accomplished extramurally. Proposals for funds for research in areas of interest to the agency are welcomed and are considered on a competitive basis. To receive information regarding application procedures for extramural funds, please contact the person indicated in the area of specific interest to you. In addition, approximately fifteen percent of EPA's research budget is used to support long-term exploratory research. Information regarding funds for exploratory research grants can be obtained from the:

Research Grants Program
Office of Exploratory Research (RD-675)
USEPA
Washington, DC 20460
(202) 382-5750

Finally, for further information regarding Office of Research and Development research publications (600/ series) or for additional copies of this report, please contact:

Center for Environmental Research Information
USEPA
26 W. Martin Luther King Drive
Cincinnati, OH 45268
CML (513) 569-7562
FTS 8-684-7562

Air

Global and Microenvironmental

Acid Deposition, Environmental Monitoring, and Quality Assurance

Indoor air research consists of development and testing of monitoring devices and the design and implementation of field studies to identify and quantitate pollutants indoors. This research supports investigation of pollutant sources, human exposures and health effects.

Methods development research investigates monitoring devices for pollution monitoring levels in homes. Results are used to produce information regarding proper use (sample locations and sample times) and performance limitations of these devices. This research will continue to develop and test these devices, especially personal monitors, in other microenvironments (buildings, vehicles, etc.).

A pilot study to investigate spatial and temporal variations in indoor air quality will be designed and implemented in conjunction with an intensive review of data needs. Based on these results, additional field studies will be conducted to increase our understanding about indoor air pollution.

Research into global climate change will develop tropospheric chemistry models to predict the impact of changes in trace gases, temperature, and humidity in the troposphere on tropospheric ozone and the hydroxyl radical.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL RTP	John Puzak	1,302.2	8
ADEMQA HQ	Tony Janetos Lance Wallace	145.0	100
ASRL RTP	Basil Dimitriades	160.0	38

Global and Microenvironmental

Environmental Processes and Effects

This research provides state-of-the-art information on the causes, biological effects and control strategies for stratospheric ozone depletion. The work should reliably quantify effects of gradually increasing ultra-violet B radiation which causes biological damage to agricultural productivity, marine and freshwater food chains for economically useful fish and to overall global climate. Field, laboratory and modeling efforts addressing the biological effects of UV-B will concentrate on sensitive field crops, and on dose responses to marine and fresh water food webs. The nature of UV-B damage to competitive

specie interactions and critical energy flow through the ecosystems may be examined. Influence of UV-B on ozone and its implications on ozone air quality attainment/non-attainment need examination. These data are sought to provide an authoritative scientific base for regulatory decisions on stratospheric ozone protection.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/COR	Robert Lackey	985.4	6.3
AEERL/RTP	William Rhodes	151.2	33.8
ASRL/RTP	Basil Dimitriades	160.0	37.5

Global and Microenvironmental

Health Effects

The goal of the indoor air health effects research program is to determine whether exposure to indoor air pollution contributes or leads to adverse health effects. Indoor air often contains higher levels of pollutants than outdoor air. Most individuals spend over 80% of their time indoors. Sensitive populations, e.g., children and the elderly, may be at higher risk from exposure to indoor air pollution. Therefore, the exposure, dose, and effects from indoor air pollution needs to be factored into the total assessment of air pollution.

The approach to study the effects of indoor air is broad. Genetic bioassay studies of the combustion products from indoor air sources including environmental tobacco smoke will be conducted in chambers, test homes, and targeted field studies to provide a comparative estimate of the potential cancer risk from various sources. Human clinical studies of volatile organic compounds will be conducted in chambers to determine effects related to the "sick building syndrome." Field and clinical studies will continue to evaluate cotinine as a biochemical marker for nicotine.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	Richard Dickerson	1,600.0	9
OHR/HQ	Donna Kuroda		

Hazardous Air Pollutant Regulatory Activities

Environmental Engineering and Technology Demonstration

The engineering program for hazardous air pollutants (HAP) is comprised of four parts: (1) to assess various industrial and combustion sources of HAPs to determine the magnitude of emissions and to assess the capability of technologies to reduce or eliminate HAP emissions; (2) to conduct source-related measurements and participate in the

management of the Agency's Integrated Air Cancer Project; (3) to assess the emissions from and controllability of sources of non-radon indoor air pollutants; and (4) to assess the emissions from and controllability of accidental releases of high hazard chemicals.

Conventional devices for controlling particulate and VOC emissions will be evaluated for their effectiveness in controlling specific HAPs from industrial and combustion sources. Research will be continued on cleaner-burning wood stoves, with inherently low emissions of HAPs, for practical and energy-efficient residential use.

Field and laboratory measurements of hazardous substances, especially mutagenic substances from residential wood stoves will be made as part of the field studies of the Integrated Air Cancer Project. Various designs of catalyst-equipped and conventional stoves will be tested.

Laboratory measurements of organic pollutants emissions from unvented space heaters, building materials, and consumer products will be continued from indoor air quality projects initiated earlier. A computerized database will be expanded on indoor source emissions. Test house studies of indoor sources will continue. Further work to develop indoor air quality models is also planned. Engineering evaluations will continue of air cleaners for indoor particles and for indoor organics vapors.

The issue of accidental releases will be addressed through a study of hazard identification and evaluation techniques, preparation of reference manuals for key hazard chemicals, and technical support to regions and states to assist in preventing such releases or reducing the hazards once such a release has occurred.

In cooperation with the Office of Air Programs, an outreach program, the Control Technology Center (CTC) program aimed at assisting Regions, states and local officials to deal with HAP sources and controls will be continued.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
AEERL/RTP	Robert Hangebrauck W. Gene Tucker	3,207.6	53
OEETD/HQ	Paul Shapiro Marshall Dick	573.7	75

Hazardous Air Pollutant Regulatory Activities

Health Effects

The health research program in hazardous air pollutants (HAPs) has three goals: to develop and validate techniques

to evaluate the toxic effects of HAPs, to produce dose-response data on the toxic effects of HAPs, and to develop methods which improve our ability to use toxicological data in performing risk assessments.

EPA researchers will develop methods to provide data on the genetic, developmental, and neurotoxic effects of HAPs. Emphasis of this research will be on the toxic components of gaseous-aerosol complex mixtures and source emissions.

Dose-response toxicological research data on the mutagenic and carcinogenic activity and noncancerous end points including neurotoxicity, physiological, and pulmonary health effects of potential HAPs will be determined. These HAPs will be selected based upon assessments prepared by the Office of Health and Assessment (OHEA) and research needs identified by Office of Air Quality, Planning, and Standards (OAQPS). The effects of selected chemicals suspected of being hazardous to the nervous system will be studied. The *dose-exposure* research will provide quantitative information on the relationship between dose (body burden) and human exposures to toxic pollutants.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	Richard Dickerson	5,753.2	66
OHR/HQ	Donna Kuroda		

Hazardous Air Pollutant Regulatory Activities

Acid Deposition, Environmental Monitoring, and Quality Assurance

The need for technology to monitor non-criteria contaminants at the regional, state, and local levels continues. EPA has developed monitoring stations to detect and measure non-criteria pollutants in Boston, Chicago, and Houston. These stations will function as a focal point for development and evaluation of monitoring methods in ambient air. Stationary source methods will be evaluated and validated. Methods for asbestos, cadmium, nickel, dioxins, and gaseous organics are needed. In addition, certain advanced methods will be evaluated, including cryogenic preconcentrations and gas chromatography/Fourier transform infrared (FTIR) spectrometry.

To support quality assurance needs within the program, reference samples will be developed and maintained, guidelines for procedures will be developed, and laboratory audits will be performed.

A series of studies to monitor human exposure is being carried out, including the Integrated Air Cancer Project (IACP) and the Total Exposure Assessment Methodology (TEAM) studies. The IACP is studying wood smoke and

mobile source emissions. The TEAM studies deal with human exposure to volatile organic compounds, pesticides, and particulates.

In the Characterization, Transport, and Fate (CTF) research program, laboratory and field studies will be conducted to determine the atmospheric lifetimes and transformation products of hazardous air pollutants; to determine deposition and removal rates of hazardous chemicals; and to identify the factors responsible for concentration levels and spatial and temporal (i.e., seasonal) variability of selected volatile organic compounds. Also, research studies will examine the atmospheric chemical and physical processes that are important in producing mutagenic compounds in the atmosphere. The information obtained from this program is used for preparing health assessment documents to determine if chemicals in the atmosphere present a hazard.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL RTP	John Clements Steve Bromberg	7,523.8	35
ASRL RTP (CTF)	Larry Cupitt	1,859.8	24
ADEMQA HQ (CTF)	Deran Pashayan	20.0	0
ADEMQA HQ	Marvin W. Bloch	388.5	0

Hazardous Air Pollutant Regulatory Activities

Scientific Assessment

Scientific assessments of HAPs evaluate pertinent research findings concerning the health effects of particular substances emitted from restricted stationary sources and/or their transformation products, as well as background information on physical and chemical properties, sources, emissions, transport and transformation, and ambient concentrations. Such assessments also evaluate chemical compositions of fuel additives, diesel and gasoline exhausts, information on actual human exposure to motor vehicle pollutants, and evidence of resulting health effects.

The Agency strategy for assessing the toxicity of various chemical substances nominated by the Office of Air Quality Planning and Standards consists of the following steps. The first is the preparation of a summary health issue assessment. This is an initial review of the scientific literature concerning the most important health effects associated with a given chemical or class of chemical substances. If the evidence suggests there are significant health effects associated with exposure to the substance(s) reviewed, then a draft health assessment document is

developed for scientific review at a public workshop. If the scientific peer review supports the conclusion that there are significant health effects, then a comprehensive health assessment is developed for public comment and Science Advisory Board review prior to final publication.

In addition, during FY 88, the Scientific Assessment Program will also provide direct assessment support to Regions and States for Agency Air Toxics Strategy.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO/RTP	Lester Grant	3,365	50

Mobile Source Pollutant Regulatory Activities

Health Effects

The health effects program developed by the Health Effects Research Laboratory in mobile sources develops and validates techniques to produce dose-response data on the toxic effects of carbon monoxide, and then use those techniques to produce dose-response information.

Clinical studies will be used to produce dose-response data on the toxic effects of low-level exposure to CO. The cardiac and respiratory effects of CO will be evaluated in human studies, as well as methods to related ambient CO levels to blood levels. Non-invasive techniques will be used to measure the cardiac effects of CO exposure. In addition, neurobehavioral effects of CO exposure will be evaluated. This information will be used in performing health risk assessments by the scientific assessment program.

Extramural funding will also be provided to the Health Effects Institute, sponsored jointly by EPA and the automobile industry to perform research on the health effects of pollutants related to mobile sources, i.e., diesel emissions, NO_2, CO, O_3, and aldehydes.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	Richard Dickerson	808.0	26
OHR/HQ	Donna Kuroda		

Mobile Source Pollutant Regulatory Activities

Acid Deposition, Environmental Monitoring, and Quality Assurance

The purpose of the Characterization, Transport, and Fate (CTF) portion of this program is to characterize the emissions from motor vehicles using both traditional fuels as well as alternative fuels, such as methanol.

Laboratory studies of the impact of low ambient temperature on the emission rates of criteria and non-criteria pollutants from light duty motor vehicles will

continue. Emphasis will be directed to the composition of organic emissions. Studies of the relationship between fuel composition, including gasoline and gasoline-alcohol blends, and the composition and rate of tailpipe, evaporative, and refueling emissions will continue. Other programs will emphasize the development of analytical procedures suitable for real-time measurement of motor vehicle emissions. Procedures for determination of the operating condition of motor vehicle emission control devices will be evaluated. Programs for examination, development, and improvement of procedures for apportionment of observed ambient pollution to motor vehicles will be conducted.

Studies will also be conducted to characterize organic emissions from motor vehicles under widely variant operating conditions, i.e., temperature, speed, and fuels. Emission rates of formaldehyde, benzene, paraffins, and other organic compounds of interest will be determined.

Research in the Monitoring Systems and Quality Assurance portion of the program focuses on developing methodology for determining exposures of the population to mobile source pollutants. A general methodology has been developed for measuring and modeling the exposures of the population to carbon monoxide, and this methodology has been successfully field tested. Future research will extend this methodology to other locations and, where possible, to other mobile source air pollutants. Detailed analyses of human exposure field data collected in selected highway microenvironments will be undertaken to develop improved commuter exposure models incorporating traffic variables (roadway type, traffic count, trip time, and seasonal characteristics). Data on human activity patterns and time budgets will be further evaluated for use in exposure models. Improved models of human activity patterns and microenvironmental concentrations will be developed and field tested. The Simulation of Human Activities and Pollutant Exposure (SHAPE) model will be modified and validated using field data from another urban area. Additional testing of basic assumptions incorporated in the NAAQS Exposure Model (NEM) will be undertaken. The purpose of the research will be to improve the accuracy and reliability of the Agency's exposure assessment methodology for mobile source pollutants.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/RTP	Gerald Akland	486.2	58
ADEMQA/HQ	Wayne Ott	0.0	0

Air

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ASRL/RTP (CTF)	Frank Black	1,287.4	60
ADEMQA/HQ (CTF)	William Keith	0.0	0

National Ambient Air Quality Standards (NAAQS)

Acid Deposition, Environmental Monitoring, and Quality Assurance

The Characterization, Transport, and Fate (CTF) portion of this program is responsible for conducting studies to determine the air pollution and meteorological factors that contribute to visibility reduction, and for developing information on the effects of particles on materials. Light extinction budget field studies will be performed to determine the contribution of various types of fine particles to visibility reduction and to determine the sources of the particles. Laboratory and field studies will be performed to identify and determine the significance of the volatile component. Visibility models will be developed.

Research on the effects of particles on materials will concentrate on the influence of particle size and composition on the soiling of paint.

Under the Monitoring Systems and Quality Assurance portion of this program, improved air pollution monitoring methods are being developed to help determine air quality trends, support compliance with standards, and meet enforcement needs. The data from these methods are often used as the basis for regulatory action. The areas investigated include ambient methods development, quality assurance guidelines and audit materials preparation.

Ambient methods development will focus on measuring particulate matter in support of anticipated changes to the National Ambient Air Quality Standards (NAAQS). EPA researchers will continue to analyze the mass and chemical composition of the particulates collected through the Inhalable Particulate Network. Also, fiber filters from the national, state, and local air monitoring stations will be analyzed for trace metals and benzo-a-pyrene.

Quality Assurance support will be provided through a standard laboratory and repository of quality assurance materials. Routine and special audits will be conducted at laboratories making ambient measurements and at compressed gas vendors. QA guidelines, handbooks, data handling systems and a precision and accuracy reporting system will be maintained and updated. QA procedures, materials, and audit techniques will be developed for compliance monitoring.

Air

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/RTP	John Puzak	3,145.1	57
EMSL/LV	James McElroy	339.1	100
ADEMQA/HQ	Marvin W. Bloch	170.0	100
ASRL/RTP (CTF)	Al Ellison	335.5	27
ADEMQA/HQ	William Keith	0.0	0

National Ambient Air Quality Standards (NAAQS)

Health Effects

This research program has three major goals: (1) to provide data on health effects of exposures to O_3, NO_2, sulfur oxides, particles, and lead using both human and animal studies; (2) to provide better models to extrapolate animal data to human effects; and (3) to develop improved test methods for research into the physiological responses of humans to the primary air pollutants.

Health Effects Research is conducted to refine and improve the toxicological data base relevant to criteria pollutants. Both human and animal-dose response studies, as well as mathematical modeling, will be given special attention to determine the deposition, clearance, and pulmonary function effects of particles, alone and in combination with ozone, NO_2 and SO_2.

The neurological consequences of lead, especially at levels previously considered to be safe in children will be studied epidemiologically, supplemented with animal studies where needed. Research will also be done to improve the models used to extrapolate animal biochemical and metabolic responses to human effects. Both human and animal experiments will provide data on the functional, morphological, and biochemical changes which occur following exposures to the primary air pollutants, and provide extrapolation techniques to predict human pulmonary and morphological responses to gases and particles.

Animal, human clinical, and epidemiology studies will provide data to determine the extent to which the primary air pollutants cause or exacerbate the development of non-carcinogenic chronic disease. Biological endpoints to be examined include development of cardiovascular or pulmonary disease, aggravation of existing conditions, changes in biochemistry and host defense mechanisms, and changes in pulmonary structure or function. Emphasis is currently placed on determining the acute and chronic effects of O_3 and NO_2 inhalation.

Air

The heath effects data from this research program are incorporated into EPA criteria documents which are used to set and revise National Ambient Air Quality Standards (NAAQS).

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	Richard Dickerson	12,849.3	33
OHR/HQ	Frode Ulvedal		

National Ambient Air Quality Standards (NAAQS)

Environmental Processes and Effects

This research provides scientific support of NAAQS by determining ozone impacts on crops due to varying ozone exposure patterns and in forest systems of economic or ecological value. With its economic emphasis, this work uses empirical methods to build observational data to show ozone impacts. Data is needed to evaluate effects of air quality standards set on crop and forest exposure patterns to show highest allowable ozone levels with least damage, and data is needed to set control options and compliance monitoring. Several remaining uncertainties for crops need resolution, such as crop coverage and exposure dynamics. In addition, process directed studies to develop conceptual or predictive models to define multiple interactions between levels of various climate stress factors, which include natural scientific explanation for crop and forest response, are needed. Field validated models will be used to predict yield effects. Due to on-going crop breeding programs, research will be planned to study heritability of crop ozone sensitivity.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/COR	Dave Tingey	2,375.6	30.3
OEPER/HQ	Kenneth Hood	120.7	20.4

National Ambient Air Quality Standards (NAAQS)

Scientific Assessment

The main objective of the NAAQS scientific assessment program is to review and revise criteria documents for sulfur oxides, particulate matter, nitrogen oxides, ozone and other photochemical oxidants, carbon monoxide and lead.

Criteria documents are mandated by the Clean Air Act and, as directed by the Act, are revised at 5-year intervals.

These documents are evaluations of the available scientific information on the health and welfare effects of criteria pollutants. As such, criteria documents are the primary source of information used by EPA regulatory decision makers in setting or revising the NAAQS.

Criteria document draft materials are developed by EPA scientists and outside expert consultants and are peer-reviewed by scientific experts in public workshops. Subsequently, the document drafts are revised and, through announcements in the Federal Register, the public is invited to comment on the resulting external review drafts, which are also reviewed in public meetings by the Clean Air Scientific Advisory Committee of EPA's Science Advisory Board. The final documents are submitted to the Clean Air Docket and are published concurrently with the proposed regulatory decisions.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO RTP	Lester Grant	1,609	55

New Source Performance Standards and State Implementation Plans

Acid Deposition, Environmental Monitoring, and Quality Assurance

Air quality models predicting the air quality impacts associated with pollution abatement strategies are used in the evaluation and development of State Implementation Plans for the control of photochemical oxidants and gases and particles.

The Characterization, Transport, and Fate (CTF) portion of this program is responsible for the conduct of air quality modeling and laboratory studies to develop a single, defensible chemical mechanism module for use in ozone air quality simulation models. A regional ozone air quality model is being developed for use in secondary ozone air quality standard development and to provide a simpler regional ozone model. Models will be used to assess the air quality impacts associated with various control strategy scenarios.

Field and laboratory studies to further develop and test different Source Apportionment Methods (SAMs) are underway and will evaluate hybrid (chemical composition and meteorology) SAMs for apportionment of regional aerosols. In anticipation of a revised particulate air quality standard based on inhalable particulates, field, smog chamber, wind tunnel, water channel, and laboratory studies are being used to develop and evaluate chemistry and dispersion components of urban scale particulate air

quality models. Research is continuing to develop a first generation regional particulate air quality model (RPM). Cooperative transport and fate studies with the Peoples Republic of China will continue. The User's Network for Applied Modeling of Air Pollution (UNAMAP) program is continuing to evaluate models to prepare computer programs for new versions of UNAMAP, prepare user's guides and supplements, and provide modeling consultation to users. Field, wind tunnel, and modeling studies are being used to develop the first generation SO_2 Complex Terrain Dispersion Model. Fluid modeling studies are being conducted on the flow in the wake of buildings.

Additional research activities in the Monitoring Systems and Quality Assurance area emphasize the development of monitoring methods and provision of quality assurance samples and support. EPA's monitoring methodologies for source air pollutants will include evaluation, methods improvement, preparation of operating guidance and manuals for developed and commercial monitoring instruments. Quality Assurance for the source monitoring program is essential to ensuring that the data of known accuracy and precision are used for regulatory and enforcement decisions. Reference samples will be provided and audits of laboratories making source measurements will be continued.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/RTP	John Puzak	1,025.0	42
EMSL/LV	James McElroy	471.0	68
ADEMQA/HQ	Marvin W. Bloch	0.0	0
ASRL/RTP (CTF)	Al Ellison	7,027.9	30
ADEMQA/HQ (CTF)	William Keith Deran Pashayan	248.4	76

New Source Performance Standards and State Implementation Plans

Environmental Engineering and Technology Demonstration

Research in this program supports the development of New Source Performance Standards (NSPS) and State Implementation Plans by aiding in the development of pollutant control technology which is cost-effective and energy-efficient. The focus of the research is on the reduction of VOC, NO_x, SO_x emissions.

Volatile Organic Compounds (VOCs) are a major cause of non-attainment of photochemical oxidant National Ambient Air Quality Standards. Extramural research will

evaluate VOC abatement technology such as adsorption, thermal oxidation, and catalytic oxidation. Of particular interest will be effective and affordable control methods for small VOC-emitting industries.

Combustion modification methods of controlling NO_x and other emissions will be evaluated to determine combustion modification (CM) methods for reducing NO_x emissions and improving the performance of utility and industrial boilers. Prior research has proven the CM methods can be effective for control of NO_x as well as other emissions, if each method is tailored to the characteristics of the specific combustion equipment (e.g., stoker or package boilers, coal or oil burners, and internal combustion engines or gas turbines). Research will evaluate an in-furnace NO_x reduction technique called reburning which involves injection of fuel downstream of the primary combustion zone. In-house reburning experiments on pilot-scale combustors will be continued and field test projects in a full-scale coal-fired utility boiler will be started. In-house tests of selective catalytic reduction (SCR) systems for internal combustion engines will be completed.

Existing technology to control gaseous and particulate pollutants is expensive. For new utility sources, approximately 30% of boiler costs are attributable to air pollution control. Design and performance data for low costs, high-reliability emission reduction technology are needed to support the Agency's regulatory functions. Technical support to regulated entities will be provided by conducting assessments and fundamental research on technologies for reduction of stack emissions of sulfur dioxide (SO_x).

SO_x emissions reduction technology research includes: In-house pilot efforts will emphasize evaluation of low cost, more active sorbents and additives for spray drying and other dry scrubbing systems. A joint EPA EPRI symposium on SO_x emission reduction via flue gas cleanup will be planned.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
AEERL RTP	Everett Plyer Robert Hangebrauck Jim Abbott	1,661.1	53
OEETD HQ	Marshall Dick	57.7	0

Indoor Air Pollution Activities

Scientific Assessment

EPA's indoor air program is geared toward identification, characterization, and ranking of indoor air problems and

assessment and implementation of appropriate mitigation strategies. EPA's research and analytical activities will pursue both source-specific and generic approaches to indoor air pollution. From a source-specific standpoint, the Agency will identify high-risk pollutant sources and characterize the exposures and health risks of various populations to those sources. At the same time the Agency will also pursue broad, cross-cutting strategies aimed at assessing the total exposure of people to indoor air pollutants and developing mitigation strategies that can address multiple pollutants simultaneously through improved building design and management techniques.

Activities in FY88 in the area of scientific assessment will include updating and revising the Indoor Air Pollution Information Assessment and the Indoor Air Reference Data Base, determining the extent of population exposure to indoor air pollutants, developing biological contaminant measurement methods, and a survey of biological contaminants for baseline data.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO-RTP	Mike Berry	180	100

Drinking Water

Health Effects of Drinking Water Contaminants

Health Effects

This research program provides dose-response data on organic, inorganic, and microbiological contaminants. It provides information on the best methods to obtain that data, and information on the interpretation of toxicological data to reduce uncertainty in risk assessment.

Selected contaminants will be evaluated to assist in setting maximum contaminant levels or developing health advisories. Increasing emphasis will be on determining the health effects of exposure to disinfectants and their by-products. Work will be done to improve methods for extrapolating health effects research data in order to assess the risks associated with simultaneous exposure to multiple chemicals in binary and complex mixtures. Focus will also be on concentrating, isolating, and identifying infectious disease agents in drinking water. Epidemiology studies on the relationship between disinfectants and cardiovascular disease and another study designed to determine the significance of low-levels of viruses to human health are underway.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL CIN	Lyman Condie	9,249.1	37
OHR HQ	David Kleffman		

Health Effects of Drinking Water Contaminants

Scientific Assessment

Revision of national drinking water regulations and health advisory guidance given to the states requires an assessment of the potential hazard to human health from exposure to chemicals in drinking water. The health assessment documents prepared under this program take the form of both criteria documents and health advisories. These documents are assessments of the health effects of exposure to contaminants in drinking water. They specifically evaluate the relevant scientific data describing the physical and chemical properties, the pharmacokinetics, the health effects in animals and humans, and the mechanisms of toxicity. The health assessments are prepared for various chemicals as requested by EPA's Office of Drinking Water (ODW). This risk assessment process enables ODW to establish a Maximum Contaminant Level Goal (MCLG), representing a level designated to preclude the risk of an adverse effect on human health.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO CIN	Cynthia Sonich-Mullin	712	58

Drinking Water

Groundwater Research

Acid Deposition, Environmental Monitoring, and Quality Assurance

This program will provide development of methods for locating abandoned wells, develop geophysical methods to detect and evaluate underground movement of fluids from injection wells and evaluate existing instruments and conduct research to develop new and advanced fiber optic techniques for monitoring ground water. The program will also investigate the effects of seasonal variability on monitoring well network design(s). In addition, accurate and reliable total measurement systems will be developed through standardized methods, laboratory evaluation, and quality control procedures.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/LV	Robert Snelling	934.6	35
ADEMQA/HQ	Vernon J. Laurie	31.8	85

Ground Water

Environmental Processes and Effects

Ground water is a major source of drinking water for the nation. This research program provides both technical information and improved methods for predicting contamination movement and transformation. The research focuses on methods development for and studies of subsurface transport and fate processes such as biological transformation, oxidation-reduction, hydrolysis, and ion exchange. Facilitated transport research will address complex mixture processes such as multiphase transport and solvent composition effects on sorption. In addition, micelle- and DOC/colloid-aided transport will be addressed. The results of the research will allow better human exposure assessments from ground-water contamination.

Research to determine the cost-effectiveness of *in-situ* aquifer restoration techniques will potentially lead to cleanup where previously the cost was prohibitive. Promising laboratory techniques will be evaluated on actual contamination incidents.

Field evaluation of techniques for determining the mechanical integrity and adequacy of construction of injection wells will occur. Work to develop technological alternatives for regulating Class V wells will begin. Methods will be developed for risk assessments in wellhead protection areas, and technical transfer activities associated with this and other programs will be emphasized.

Drinking Water

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
RSKERL/ADA	George Keeler	4,493.3	33
OEPER/HQ	Steve Cordle	409.0	44

Drinking Water Technology

Acid Deposition, Environmental Monitoring, and Quality Assurance

This program will provide support for the Agency-wide mandatory quality assurance program. The ten regional laboratories will be evaluated annually in support of the National Interim Primary Drinking Water Regulations monitoring certification program. This program will also conduct methods development research and provide analytical procedures to produce precise and accurate total measurement systems for chemical, radiochemical and microbiological analysis. It will provide technically and economically feasible analytical procedures to monitor contaminants for use by the Agency, States, municipalities, and operators of public drinking water systems.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL CIN	Robert Booth	1,436.3	45
EMSL LV	Robert Snelling	329.8	95
ADEMQA HQ	Vernon Laurie	64.1	95

Drinking Water Technology

Environmental Engineering and Technology Demonstration

To support revision of the national drinking water standards, this program provides data on the technologies available, what they can attain in terms of drinking water quality, and what they cost. Focus is on removal of volatile organic compounds, organics responsible for formation of trihalomethanes, inorganic and microbiological contaminants and on problems related to maintaining water quality in distribution systems. Emphasis will be on developing cost information for treatment processes and for entire water systems. Evaluation will also be made of the tradeoffs in planning for rehabilitation of older water systems. In addition, efforts will be made to address the problems of small utilities and to assist the states and municipalities in complying with maximum contaminant levels.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
WERL CIN	Robert Clark	5,396.0	68
OEETD HQ	Bala Krishnan	0.0	0

Water Quality

Water Quality Based Approach/Permitting

Acid Deposition, Environmental Monitoring, and Quality Assurance

The monitoring research program develops chemical, physical, and biological methods for measuring site-specific and ambient water pollution concentrations. Most of this research is conducted in-house at EMSL-Cincinnati with a small portion being conducted at EMSL-LV.

Research emphasizes new measurement method standardization and development of quality assurance support such as guidelines, calibration materials, and performance audits. Additionally, research seeks to extend the sensitivity of chemical methods for measuring toxic metals in water. Research on biological monitoring methods also includes developing methods which screen toxic concentrations of pollutants in ambient waters, rather than identify specific substances. Quality assurance procedures for chronic and acute toxicological effects monitoring, standardization of microbial, viral sampling, and analysis methods are provided. Virus sample preservation and assay protocols will be standardized. Research on physical measurement methods concentrates on documenting the validity and accuracy of sampling regimes and flow-sensing equipment. The quality assurance program which provides quality control calibration materials and procedures for standardization of chemical and biological analysis also conducts two audits of analytical methods performance yearly.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL-CIN	Cornelius Weber James Lichtenberg John Winter	2,027.5	99
ADEMQA/HQ	Charles Plost	90.5	89

Water Quality Based Approach/Permitting

Environmental Processes and Effects

A water quality-based approach to pollution control provides for correction of ambient water quality problems that remain after mandated pollution control technology (e.g., secondary treatment, effluent guidelines) is in place. This requires the ability to translate water quality standards into specific effluent conditions and discharge limitations for municipalities and industries. Research will be undertaken to provide the necessary information and scientific tools, including: water quality criteria, development modification protocols; contaminated sediment assessment techniques; wasteload allocation

techniques; complex effluent testing procedures; and ecoregion and use attainability analyses. Research on the water quality functions of wetlands, and cumulative effects of wetlands loss and the impacts of mitigation of wetlands will also be conducted.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL ATH	Robert Swank	1,190	51
ERL COR	Spencer Peterson	1,055	53
ERL DUL	Nelson Thomas	2,570	89
ERL NARR	Norbert Jaworski	1,255	82
OEPER HQ	Chieh Wu	600	90

Water Quality Based Approach/Permitting

Health Effects

Investigators will field validate short-term tests for carcinogenic, mutagenic, and reproductive effects to determine whether or not a site receiving a large number of chemical contaminants into ambient waters is a public health risk. Health effect indicators for shellfish growing waters, are being developed. The results of these studies will be used to revise and update water quality criteria and NPDES permits.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL CIN	Lyman Condie	1,636.9	26
OHR HQ	David Kleffman		

Water Quality Based Approach/Permitting

Scientific Assessment

EPA's overall research program with regard to water quality emphasizes development of the scientific and technical base to help states develop site-specific standards and to conduct use-attainability analyses. The scientific assessment program will provide guidance for assessing the risk of human exposure to mixtures of toxic chemicals, and evaluate site-specific health hazards as required by the states and EPA. As a part of their effort, EPA develops documentation for the specific risk assessments.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO CIN	Cynthia Sonich-Mullin	221	68

Water Quality

Industrial Wastewater Treatment Technology

Acid Deposition, Environmental Monitoring, and Quality Assurance

Research will support the Agency in the implementation of technology-based effluent limitation regulations and the modification of enforcement activities as required by water quality-based permit adjustments. Methods standardization research will be directed to the improvement of precision, accuracy, and method detection limit of existing regulated organic contaminants. Research will also validate and correct analytical methods for the analysis of high priority industrial wastewater components as well as evaluate alternative analytical methods to support the National Pollution Discharge Elimination System (NPDES) program.

Quality Assurance activities include conducting both the target survey and full audit of some 7,000 major NPDES permittees for the annual Discharge Monitoring Report Quality Assurance (DMRQA) study; maintenance of a repository for distribution of calibration, quality control, and performance evaluation samples; and the conduct of performance evaluation studies. The research program will support NPDES quality assurance by providing quality control samples and protocols and by maintaining the standards repository, including auditing monitoring systems data reliability, DMRQA and documentation of its precision and accuracy.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CIN	James Lichtenberg John Winter	1,087.9	100
ADEMQA/HQ	Charles Plost	112.6	100

Wastewater Treatment Technology

Environmental Engineering and Technology Demonstration

The wastewater technology research program provides the technical information and engineering assistance needed to develop and implement the regulations and guidance for disposal of sludge and control of pollution from municipal treatment plants to bring plants into compliance with state discharge permits. This program also provides the research in industrial wastewater characterization and control technology needed to support the National Pollutant Discharge Elimination System. The program focuses on toxicity reduction evaluations to support the development of water quality-based permit limitations in municipal wastewaters, and BCT and BAT limitations in industrial

wastewaters. Design, cost and performance information for sludge stabilization, pathogen reduction, and dewatering processes will be provided to support sludge regulation development and implementation. Focus is also on supporting the Innovative/Alternative technology program by evaluating and transferring information on emerging technologies, and by identifying the candidate facilities for potential 100% modification/replacement costs.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
WERL/CIN	John Convery	6,582.4	40
	Alden Christianson	759.3	45
OEETD/HQ	Don Tang	0.0	0

Wastewater Treatment Technology

Environmental Processes and Effects

This research will identify and determine distribution of unlisted chemicals in industrial wastewaters. Compounds that can be identified by empirical mass spectra matching as well as those that elude identification by this technique will be included.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL ATH	William Donaldson	550	58
OEPER HQ	Chieh Wu	30	0

Wastewater Treatment Technology

Health Effects

Health effects research focuses on human health aspects of municipal sludge disposal. The data from these studies are used by the Agency for formulation of regulations, permits, and guidelines under the Clean Water Act. One emphasis, at present, is on land use and disposal of municipal sludges which requires careful assessment of the effects on human health of exposure to pollutants contained in the sludges. Research will focus on the fate of pathogenic organisms, particularly parasites and viruses, and on toxic risks of heavy metals and organic chemicals. A critical aspect of human exposure to municipal sludges is the potential close human contact from sludge distribution and marketing systems. Studies of the occurrence of pathogens and chemicals in these systems will be completed. Information from these studies will be part of a determination of the risks to the human population from sludge distribution and marketing.

Water Quality

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/CIN OHR/HQ	Bernie Daniel David Kleffman	1,324.4	91

Wastewater Treatment Technology

Scientific Assessment

The scientific assessment program provides risk assessment methodologies for chemicals and pathogens in support of regulatory decision making on the use and disposal of municipal sludge. Numerical criteria and/or management practices for pollutants in sludge are developed based on the risk assessment methodologies. The use and disposal options are landfilling, land application (including distribution and marketing), incineration and ocean disposal.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO/CIN	Cynthia Sonich-Mullin	417	25

Marine, Estuaries, and Lakes

Environmental Processes and Effects

This program has three components: ocean disposal, coastal waters, and Great Lakes.

To support ocean disposal permit decisions, there is a need to provide decision makers with rationale and procedures which are scientifically sound. These should provide guidance for the acquisition of information and the interpretation of this information in order to support ocean disposal permit decisions. Under the ocean disposal research program, emphasis will be given to the development and testing of procedures to better evaluate the impacts of ocean disposal actions; development of procedures to satisfy monitoring needs for permit, surveillance, and hazard assessment application; and development of procedures for predicting the bioaccumulation of contaminants and evaluation of the significance of bioaccumulation processes, resultant tissue residues and biological effects.

Methods for better source control decisions in the NPDES and construction grants program are needed for estuaries and near coastal water. The research program is developing generic procedures for conducting wasteload allocations. These generic methods are being developed using data intensive case studies.

Water Quality

The Great Lakes research program will measure, describe and predict the distribution, movement, fate, and effects of toxic substances in nearshore "areas of concern" identified by the US Canada Water Quality Agreement. Emphasis will be given to problems involving in-place pollutants and mass balance modeling. This program will also provide the International Joint Commission (IJC), the Great Lakes National Program Office (GLNPO), EPA Regions and Great Lakes states with technical support and research data synthesis related to activities under the US Canada Water Quality Agreement.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL NARR	Norbert Jaworski	3,570	51
ERL GB	Rod Parish	250	76
ERL DUL	Gil Veith	1,920	23
OEPER HQ	Sam Williams	430	77

Hazardous Waste

Alternate Technologies

Environmental Engineering and Technology Demonstration

The treatment program examines both existing and emerging alternative techniques for treating or detoxifying hazardous materials. Emphasis continues to be placed on those waste streams which will be banned from land disposal facilities.

Research is being conducted to evaluate in-situ methods for the destruction/detoxification/containment of dioxins/furans and pollutants related to the production dioxins and similar toxicants. Major investigation will involve the accelerated evaluation of the mobile incinerator and destruction tests of potassium polyethylene glycolates (KPEG) on wood treating wastes. The purpose of this research is to determine the economic viability of the technique and to establish: (a) test burn protocols; (b) health and safety protocol; (c) site-specific, risk assessment protocol; (d) an economic model for estimating the cost of treatment per unit of material processed; and (e) national and state permit protocol.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HWERL/CIN	C. Dial A. Klee I. Wilder	5,604.7	29
OEETD/HQ	P. E. desRosiers	314.1	100

Dioxin

Environmental Processes and Effects

The research is designed to provide techniques and necessary data for predicting the rate and extent of movement and transformation of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and selected isomers in soils and ground waters. Also, the bioavailability of dioxins is evaluated and the potential for uptake of dioxins by plants, fish, and large animals is determined for defining the potential biomagnification in food chain systems.

ERL/Athens is evaluating the photodegradation of 2,3,7,8-TCDD in soils. RSKERL/Ada is determining the transport, fate, and biotransformation of 2,3,7,8-TCDD and isomers in soils. ERL/Duluth is studying the bioavailability to fish of dioxin and selected isomers from contaminated sediments, while the program at ERL/Corvallis deals with comparative plant uptake kinetics and the potential bioaccumulation of 2,3,7,8-TCDD from contaminated soils in large animals.

Hazardous Waste

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/ATH	Rosemarie C. Russo	50.0	0
RSKERL/ADA	Harold G. Keeler	146.5	59
ERL/DUL	Philip M. Cook	271.2	8
ERL/COR	Harold Kibby	70.8	58

Dioxin

Health Effects

The purpose of the dioxin health research program is to provide improved methodologies and assessments for prediction of toxicity and exposure to halogenated dioxins, furans, and related compounds. Tetrachlorodibenzodioxin (TCDD) and some of its presently uncharacterized congeners are among the most highly toxic compounds. This research program is designed to improve the scientific methodology for detection of these toxins and characterization of their effects. Specific areas of research are the investigation of the effects of polychlorinated dibenzodioxins and dibenzofurans on the immune system and serum chloresterol. In addition, the structure-activity relationship of various congeners to specific biological activity will be determined.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL RTP	Richard Phillips	100.0	0
OHR HQ	Randall Bond		

Dioxin

Scientific Assessment

This program supports the activities of the Agency's dioxin program through research designed to fill gaps in the Agency's information base on dioxin in order to reduce the uncertainties in dioxin risk assessments. The specific projects include analysis of soil ingestion patterns in children, and investigation of the pharmacokinetics of 2,3,7,8-TCDD in rhesus monkeys as a model for pharmacokinetics in humans.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA HQ	Alan Ehrlich	318	3

Hazardous Waste

Incineration

Environmental Engineering and Technology Demonstration

Incineration research focuses on four areas: characterizing performance of existing thermal destruction technologies; developing methods of rapid cost-effective compliance monitoring of these facilities; characterizing the products of incomplete combustion and their formation conditions; and developing methods to predict performance to avoid process failure and control process reliability. The research is conducted at laboratory and pilot-scale facilities in Cincinnati, Research Triangle Park, and Jefferson, Arkansas. The hypotheses from this program are verified in full-scale field tests. The program examines conventional incineration as well as high temperature industrial processes.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HWERL/CIN	E. Oppelt	2,328.7	31.2
OEETD/HQ	K. Jakobson	118.9	100.0

Incineration

Health Effects

The carcinogenic and non-carcinogenic health effects of emissions and residues from hazardous waste incineration (HWI) and municipal waste combustion (MWC) will focus on the following objectives: Perform a comparative assessment of the mutagenicity and carcinogenicity of the products of incomplete combustion (PICs) from HWI in comparison to MWC and other industrial and residential combustion sources. Identify the principal mutagenic/carcinogenic chemicals in HWI and MWC emissions by using bioassay-directed chemical characterization. Determine the relationship between exposure, tissue dose and target cell (DNA) dosimetry for the purpose of providing data needed for risk assessment. Support the evaluation of engineering and control technology parameters by using short-term bioassays in the evaluation of these parameters to determine operational conditions which will minimize risk. Provide a comparative assessment of waste disposal alternatives. Evaluate the toxicity of HWI and MWC emissions, collected after dilution, in *in vitro* target cell bioassays and short-term *in vivo* assays. Evaluate the inhalation toxicology of HWI/MWC whole emissions after dilution using the EPA exposure chambers in connection with pilot scale incinerators.

Hazardous Waste

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL	Joellen Lewtas	1,050.0	10
OHR HQ	Randall Bond		

Incineration

Scientific Assessment

As incineration is being proposed, and used, to treat municipal wastes, it is essential to develop the appropriate methods for assessing the risks resulting from use of incineration itself and assessing the risks remaining after the waste has been burned. A comprehensive risk assessment methodology for municipal waste incineration is being developed in this program and will also be applied to specific situations.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO/CIN	Larry Fradkin	357	30

Land Disposal

Environmental Engineering and Technology Demonstration

With regard to land disposal, synthetic and clay liners will be studied and the effectiveness of alternative closure and monitoring procedures for surface impoundments will be investigated. Technical Resource Documents will be updated for use by regional and state agencies for permitting hazardous waste disposal facilities and for enforcing applicable regulations. This program will update documents for disposal facility design, operation, maintenance, and closure.

Research is also being conducted to characterize air emissions from hazardous waste treatment, storage, and disposal facilities and to assess methods to control them.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HWERL/CIN	N. Schomaker	2,425.6	28
OEETD/HQ	K. Jakobson	127.4	100

Hazardous Waste

Quality Assurance

Acid Deposition, Environmental Monitoring, and Quality Assurance

To ensure that the data on which regulations and enforcement are based are accurate, QC samples will be provided to USEPA contractor, state, and local laboratories conducting RCRA monitoring. Calibration standards will be provided for Appendix IX compounds to USEPA contractor, state, and local laboratories. Natural matrix, liquid and solid performance evaluation samples will be developed and distributed to RCRA contractors, EPA, and state laboratories conducting RCRA hazardous waste analyses. Performance evaluation (PE) materials that contain the pollutants of interest at the levels encountered in the environment will be developed. Statistical data on the laboratory evaluations will be reported to the Office of Solid Waste. Referee laboratory analyses on all RCRA samples will be conducted. NBS traceability for PE, QC, and method validation study samples prepared for RCRA monitoring activities will be provided.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CIN	Thomas Clark	616.5	15
EMSL/LV	Robert Snelling	662.8	30
EMSL/RTP	Jack Puzak	175.3	50
ADEMQA/HQ	John Koutsandreas	69.3	10

Releases

Acid Deposition, Environmental Monitoring, and Quality Assurance

In order to determine whether underground storage tanks (UST) containing hazardous materials are leaking, an evaluation of basic leak detection monitoring methods for outside an UST will be conducted. This will include: the establishment of candidate performance criteria for several classes of techniques; the development of a test protocol for determination of the performance criteria; and testing of the "most promising" leak detection methods to validate the test procedure and to establish that instrumentation presently exists which can meet the candidate performance criteria.

Network design for the placement of leak detection sensors will focus on the excavation zone around tanks with emphasis on vapor monitoring. However, monitoring in the saturated zone and in native soils will also be considered. Field measurements will be conducted and existing private and local/state experiences with leak detection will be investigated. Technical guidance will use a

panel of experts to develop a "decision tree" approach to provide guidance for the many and varied sites throughout the country. New technologies for leak detection monitoring, such as fiber optics and geochemical sensors, will be evaluated.

The Clean Water Act (Section 311) mandates that Spill Prevention Control and Countermeasure plans be prepared for all facilities engaged in the production, storage, processing, and distribution of hazardous materials. EPA regional offices are responsible for ensuring compliance. The ADEMQA provides remote sensing techniques for monitoring. Support will be provided to the Regions for the development and revision of monitoring techniques.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL LV	Robert Snelling	1,414.7	30
ADEMQA HQ	John Koutsandreas	0.0	0

Releases

Environmental Engineering and Technology Demonstration

Underground storage tank (UST) research is evaluating prevention, detection, and corrective action technologies to identify cost-effective, reliable techniques and equipment for USTs. Early work is producing state-of-the-art documents for each type of technology. The primary focus of ongoing work is the evaluation of leak detection technologies at a test apparatus in Edison, NJ, and the targeting of high potential technologies for improved performance. Best engineering practices for leak prevention, the detection of leaks, and site cleanup will be documented.

To provide technical support in preventing and containing hazardous spills, reports will be issued summarizing research on the evaluation of specialized equipment and techniques for prevention, control, removal, and disposal of hazardous releases.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HWERL CIN	J. Farlow	2,328.7	31
OEETD HQ	D. Berg K. Jakobson	118.9	100

Hazardous Waste

Releases

Environmental Processes and Effects

Within this activity, research is conducted to address evaluation of assessment and cleanup techniques for unplanned releases of hazardous wastes. This includes the development and evaluation of a multiple bioassay screening protocol to indicate the biological hazard associated with contaminated soils, water, and sediment; and the determination of the applicability and cost-effectiveness of *in-situ* reclamation techniques for unsaturated-zone and ground-water contamination resulting from leaking underground storage tanks and other hazardous waste sources.

ERL/Corvallis has developed and is now testing and field evaluating a multimedia, multiorganism bioassay designed to indicate whether the toxicants in contaminated water, soil, and sediments are biologically available and if the level of bioavailability poses a significant risk to exposed organisms in the environment. At RSKERL/Ada, coordinated laboratory and field tests of biological, physical, and chemical methods, previously tried at hazardous waste sites, are being conducted to determine their cost and applicability to cleanup of pollutants from leaking underground storage tanks.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/COR	Spencer A. Peterson	163.1	100
RSKERL/ADA	Harold G. Keeler	235.9	55

Waste Characterization

Environmental Processes and Effects

Regulation of hazardous wastes in the most cost-effective manner requires methods and data for predicting toxicity of waste materials and evaluating the concentrations of these materials at some point of exposure, and then integrating these methods for different media into single evaluation techniques which incorporate uncertainty into the predictions.

ERL/Duluth is developing methods and data for rapidly predicting the toxicity and bioaccumulation potential of wastes, waste streams, and leachates on the basis of quantitative chemical structure-activity relationships. This is achieved by linking chemical molecular descriptors with known toxicities of single chemicals and chemical classes, developing a model to predict toxicity of chemical mixtures on the basis of individual components, identifying modes of

action of chemical types, and comparing fish dose response relationships to those of mammalian species.

Providing field-evaluated methods and data to predict the concentrations of hazardous chemicals in the subsurface environment from the treatment, storage, or disposal of wastes is the thrust of the program at RSKERL/Ada. Physical, chemical, and biological processes that govern the transport rate, transformation, and fate of wastes are evaluated and their mechanisms are described in mathematical models. These, in turn, are evaluated through field experiments.

Integrated, multimedia mathematical models and data are being developed by ERL/Athens for implementing the land disposal banning rule and evaluating waste management and treatment needs based on potential human health and environmental impacts. Probabilistic techniques are developed and used to address uncertainty. The various media models are coupled to produce both screening-level and more site-specific multimedia exposure assessment packages.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/DUL	Philip M. Cook	781.7	59
RSKERL/ADA	Harold G. Keeler	3,039.1	36
ERL/ATH	Rosemarie C. Russo	3,179.5	23
OEPER/HQ	Will C. LaVeille	789.1	55

Waste Characterization

Health Effects

Listing of substances under the Resource Conservation and Recovery Act (RCRA) requires the ability to characterize the potential health hazards of wastes. This research program focuses on developing a three-level biological testing battery of short-term tests to make determinations of the potential health hazard of manufacturing process residues. Emphasis will be on recognizing complex mixtures as hazardous wastes for disposal purposes. This current research is to develop a screen for Level I of a three-level testing battery. This prescreen protocol will be an abbreviated and inexpensive screen for large numbers of RCRA samples. The screen will provide a rapid and sensitive prioritizing assessment of the potential toxicity of RCRA samples. In 1987, the program will begin validating the use of the prescreen protocol on actual field samples from hazardous waste sites.

Hazardous Waste

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	Richard Phillips	1,419.9	41
OHR/HQ	Randall Bond		

Waste Characterization

Scientific Assessment

This program provides assessments of the health effects and risks arising from hazardous wastes, improved methods for performing such assessments, and chemical-specific health summaries. These are supplied to the EPA's Office of Solid Waste (OSW) to support a variety of regulatory activities and to EPA regional offices, and the states for use in evaluating permit and enforcement actions.

One type of assessment, the health and environmental effects document, characterizes a waste and assesses the hazards posed to humans or the environment by exposure to it. The profiles support decisions on listing or delisting a chemical as a hazardous waste. Most of this work is done by extramural contract.

In addition, the program develops methods to assess the extent of human health effects and human exposure to complex hazardous wastes. These methods support efforts to assess and refine proposed RCRA permits and to prepare supporting documentation for enforcement decisions. Finally, to support the prevention and containment of hazardous spills, extramural contractors develop chemical-specific health summaries for use in evaluating alternatives for dealing with hazardous spill contaminants.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO/CIN	Christopher DeRosa	3,578	32

Waste Identification

Acid Deposition, Environmental Monitoring, and Quality Assurance

To improve procedures to characterize wastes for listing under RCRA, research will be conducted to develop methods for characterizing and detecting particular wastes and providing criteria for determining if those wastes constitute a potential hazard. The lack of standardized methods emphasizes the immediate need for a comprehensive program to assure that data of known quality are being collected. Methods will be tested for

application to highly toxic wastes in soil and sediments, for detection of organics in the ambient air of waste disposal facilities, and for determining the reactions of wastes in all media. A validation of the analytical methods contained in the SW-846 document is being conducted.

Techniques for field monitoring of waste sites will be improved, including statistics for sampling design and evaluated standard methods. RCRA land disposal regulations require the establishment of a ground water monitoring program at most facilities, including detection and compliance of saturated and vadose zone monitoring. Of particular importance is subsurface monitoring of sites and investigation of new techniques for monitoring soils, and biota, ambient air, and waste incineration emissions. Methods will be developed to detect trace metals in ground water, ambient water, and sludges. A flux chamber method will be evaluated to determine chemical volatility at waste sites.

Efforts will be directed toward validating waste incinerator test methods for principal organic hazardous constituents from waste incinerator stacks. Validated methods for continuous monitoring of carbon monoxide and hydrochloric acid emissions will be developed.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL CIN	Thomas Clark	1,761.7	50
EMSL LV	Robert Snelling	6,357.1	25
EMSL RTP	John Puzak	868.6	30
ADEMQA HQ	John Koutsandreas	0	0

Biotechnology/Microbial and Biochemical Pest Control Agents

Environmental Engineering and Technology Demonstration

This research program plan addresses the three primary engineering-oriented research concerns posed by OTS. In its implementation of Premanufacturing Notice (PMN) process of TSCA:

- mechanisms of accidental or deliberate release of the modified genome or organism from the site of production (e.g., in effluents);
- availability and effectiveness of containment controls or destruction techniques; and
- worker exposure, particularly due to aerosols.

In order to satisfy these concerns, the program is divided into two sub-sections. The first addresses biologically based manufacturing processes, and the second addresses deliberate application to a specific environmental area in a remedial action to destroy or detoxify another pollutant present in that environment.

Tools will be developed for PMN review under the first sub-program which permit assessment of the occurrence, magnitude, and degree of risk management applicable to deliberate and accidental releases from biologically based manufacturing processes. Models will be developed along with an information base which OTS can use as a guide for identification of potential hazards and implementation of safeguards for reduction of risk to acceptable levels.

Because genetically engineered microorganisms have already been developed for applications requiring deliberate release into the environment, the second sub-program addresses the development of procedures for assessing the safety aspects of engineering techniques for introducing these microorganisms into the enviornment. Tools developed under this sub-program will allow the assessment of the risk of migration from the site and risk management techniques to prevent and mitigate migration.

A number of applications will be addressed in the form of scenarios appropriate to the environmental conditions likely to be encountered at representative sites. Applications considered for evaluation include: agricultural formulations; pollutant clean-up and control (spills, landfills, contaminated sediments, oil spills); tertiary oil recovery; in-situ mineral recovery (metals leaching, oil shale); and other operations not contained in chemical processing equipment in the traditional sense.

Toxic Chemical Testing/Assessment

The engineering assessment protocols for release and exposure will be structured to account for several sets or combinations of various biological properties, or subsets, and appropriate applications involving deliberate environmental release. Further effort will be devoted to identifying those specific data (chemical, physical, and biological) that will be required as inputs to the engineering risk assessment protocols so that such data can specifically be developed and submitted as part of the PMN review procedures.

In FY87, assessments of techniques to prevent releases of bioengineered organisms during their manufacture were completed. Investigation by risk and failure analysis were also initiated on pump seals and safety units to predict release and exposure potential.

In FY88, advance studies on decontamination technology will develop experimental data on kill tank efficiency on sampling to ensure 100% kill. Evaluation of containment approaches will be completed.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HWERL CIN	John Burckle	383.5	25
OEETD HQ	Bill McCarthy	8.5	10

Biotechnology/Microbial and Biochemical Pest Control Agents

Acid Deposition, Environmental Monitoring, and Quality Assurance

This research evaluates and standardizes monitoring methodology to identify and quantify release of genetically engineered microorganisms or biotechnology products into the environment. Standardized procedures are validated and developed into guidelines for routine monitoring applications.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL LV	Gareth Pearson	146.0	0
ADEMQA HQ	Michael Dellarco	0.0	0

Toxic Chemical Testing/Assessment

Biotechnology/Microbial and Biochemical Pest Control Agents

Environmental Processes and Effects

The biotechnology research effort is concerned with interactions between microorganisms and ecological processes in an attempt to develop comprehensive knowledge of the biochemical, physiological, and genetic mechanisms involved. The program will examine the potential environmental risk associated with the application of genetically engineered microorganisms (GEMs).

Assessment of environmental impacts of GEMs requires reliable methodologies for identification and enumeration in environmental samples. The methods must address the analytical and operative criteria required for any monitoring program. They must be sensitive and specific to differentiate GEMs from the background of indigenous organisms. They have to be feasible, accurate, reproducible, and widely applicable since samples will differ greatly from one another, such as leaf surfaces and freshwater reservoirs.

In addition, laboratory systems (microcosms) containing sediment, water, and indigenous microorganisms are used to assess the fate of GEMs in various ecosystems. These systems attempt to simulate interactions between microorganisms surfaces. The fate of microbes in microcosms is compared with fate in natural systems to assess the validity of laboratory data.

Research in this area applies techniques of molecular and classical genetics to ecological studies to address questions on survival and growth of novel microorganisms. Questions such as specific niche requirements, selective advantages of new genotypes, and potential for causing harmful effects to populations, ecosystems, or processes will be examined. The work requires techniques to enumerate and detect GEMs or genetic material in complex ecosystems. The research also addresses genetic stability of altered microorganisms, including transmissibility of plasmids and other genetic information *in situ*.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/GB	Henry F. Enos	243.4	100
ERL/COR	T. Murphy	220.4	100
OEPER/HQ	Frederick Kutz	2,953.1	0

Biotechnology/Microbial and Biochemical Pest Control Agents

Health Effects

Biotechnology research is aimed at the development of methods to evaluate the potential health hazards of

genetically engineered organisms and the products of these microorganisms. Potential mechanisms of action and screening methods for adverse mechanisms are being investigated. Models are being developed to assess the potential dispersal capability of genetically engineered genes.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP OHR/HQ	William F. Durham Lynda Erinoff	339.7	46

Ecology: Ecotoxicity and Risk Assessment

Environmental Processes and Effects

Environmental risk assessment studies on the linkage of environmental exposure and ecotoxicology hazard assessment techniques, and development of methods to evaluate risks continues.

The ecotoxicology studies include the movement, transformation and ultimate disposition of toxic substances in all environmental media and is a critical component of this risk assessment. How plants and animals or larger ecosystems are affected by toxic substances are also the subjects of this research effort. This involves specific activities for developing and validating tests and methodologies for assessments on specific existing chemical evaluations to be used in rule making by the Office of Toxic Substances.

Activities in this research program are conducted at four field laboratories and EPA headquarters as follows:

- ERL Athens—transport and transformation of organic and inorganic substances in freshwater and multi-media environments, and development of SAR techniques and models to predict the fate of new chemicals;
- ERL Corvallis—fate and effects of toxic substances and genetically engineered organisms in terrestrial environments;
- ERL Duluth—effects of toxic substances in freshwater environments, and development of SAR regarding the effects of new chemicals;
- ERL Gulf Breeze—fate and effects of chemicals and genetically engineered organisms in estuarine marine environments.

Toxic Chemical Testing/Assessment

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/ATH	Rosemarie C. Russo	269.5	100
ERL/COR	Thomas A. Murphy	55.1	100
ERL/DUL	Gilman Veith	0.0	0
ERL/GB	Henry F. Enos	0.0	0
OEPER/HQ	Frederick W. Kutz	954.9	0

Ecology: Transport/Fate/Field Validation

Environmental Processes and Effects

This research encompasses the determination of the effects, movement, transformation, and ultimate relocation of toxic substances and their degradation products that inadvertently enter into all environmental media. This program provides information on how plants and animals and larger ecosystems are affected by exposure to toxic substances caused by accidents in commerce and industry. Specific activities include developing and validating tests for assessing hazards, exposure and estimation of the fate of existing chemicals.

Information developed in the above studies provides data necessary for hazard and exposure assessment tests and mathematical models of chemical transport, transformation and fate. These results allow the Agency to determine toxic substances in environmental media and to relate these estimates to terrestrial and aquatic systems. These data are used as input to models which predict the accumulation of toxic chemicals in food chains. This research will demonstrate how important biodegradation is in this process.

Activities in the programmatic areas of transport, transformation and fate, and biodegradation of chemicals are conducted at four field laboratories. Their locations and the research they conduct are as follows:

- ERL/DUL—effects of toxic substances in freshwater environments;
- ERL/GB—fate and effects of toxic chemicals and genetically altered organisms in estuarine/marine systems;
- ERL/ATH—development of exposure assessment methods and evaluation and transformation processes;
- ERL/COR—fate and effects of toxic substances in terrestrial systems.

Toxic Chemical Testing/Assessment

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL ATH	Rosemarie A. Russo	969.6	100
ERL GB	Henry F. Enos	927.0	94
ERL COR	Thomas A. Murphy	849.1	100
ERL DUL	Gilman Veith	112.6	100

Exposure Monitoring

Acid Deposition, Environmental Monitoring, and Quality Assurance

Research for exposure monitoring is dedicated to development, testing, and standardization of monitoring methods to estimate total human exposure and population exposures. Human activity patterns are studied to improve estimates of exposure. Total human exposure data are used to construct models to estimate an individual's pollutant exposure in all media.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL LV	Gareth Pearson	1,489.2	36
EMSL RTP	Jack Puzak	903.9	12
ADEMQA HQ	Michael Dellarco	150.0	0

Health: Markers, Dosimetry, and Extrapolation

Health Effects

This research is aimed at providing techniques to reduce the uncertainties in risk assessments. Techniques are needed to extrapolate between adverse effects seen in animal species and human health effects and between high doses used in animal toxicity testing and low doses typical of environmental exposure. Dosimetry models are being developed for oral, dermal, and inhalation routes of exposure. Biological markers research focuses on the development of indicators of biological dose and resulting effects for eventual application to studies of human populations.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL RTP	William F. Durham	5,506.7	28
OHR HQ	Lynda Erinoff		

Toxic Chemical Testing/Assessment

Health: Markers, Dosimetry, and Extrapolation

Acid Deposition, Environmental Monitoring, and Quality Assurance

This research evaluates biochemical, genetic and immunologic techniques as indicators of human exposure to chemical pollutants. These biomarkers are tested for sensitivity, selectivity and reliability in human exposure monitoring systems. Field studies are used to validate and standardize biomarkers for routine applications in exposure monitoring. Monitoring results are correlated with human activity patterns to describe the sources of exposure.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/LV	Gareth Pearson	177.6	16
ADEMQA/HQ	Michael Dellarco	0.0	0

Special Human Data Needs

Health Effects

This research is designed to provide information to assist in identifying and regulating existing chemicals with potential human health risks. Research focuses on developing epidemiological and biostatistical methods. Efforts in biochemical epidemiology are underway to identify and evaluate biomonitoring and screening methods for potential application to human environmental epidemiology.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	William F. Durham	2,103.5	16
OHR/HQ	Lynda Erinoff		

Structure Activity Relationships

Environmental Processes and Effects

This thematic research program is designed to determine the disposition of new toxic chemicals in all environmental media and how to determine if selected plants and animals might be affected. This involves developing structure-activity relationships (SAR) for rapid estimation of the fate and effects of new chemicals. Structure-activity relationship research develops methodologies based upon molecular structure characteristics to rapidly assess the environmental fate and toxicity of new chemicals. Structure-activity includes those data bases mathematical models which are used for predicting bioaccumulation, toxicity, and fate. Activities also include the development of data bases on plant uptake, fate

of organic chemicals, toxicity to fish and reactivity of chemicals in the air. Activities in this research program area are conducted at two field laboratories. Their geographic locations and the kinds of research they conduct are as follows:

- ERL/ATH—transport and transformation of both organic and inorganic substances in freshwater and multi-media environments and development of SAR to predict the potential fate of new chemicals.
- ERL/DUL—effects of toxic substances in freshwater environments, and development of SAR to predict the effects of new chemicals on aquatic organisms.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/ATH	Rosemarie C. Russo	377.3	100
ERL/DUL	Gilman Veith	646.0	30

Structure Activity Relationships

Health Effects

Methods are being developed to use combinations of descriptions based on molecular structure to predict enzymatic, genetic, carcinogenic, and other activities of new chemicals to support section 5 of TSCA. Techniques include pattern recognition and statistical and thermodynamic analyses. In addition, chemical data bases are being constructed for use in predicting toxicological responses for new chemicals with similar structures.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL RTP	William F. Durham	1,029.1	44
OHR HQ	Lynda Erinoff		

Support for Toxic Substances Control Act (TSCA)

Acid Deposition, Environmental Monitoring, and Quality Assurance

Quality assurance research efforts provide support to program activities. Research is conducted to evaluate the reliability and reproducibility of analytical methods for complex organic chemical compounds used in environmental monitoring field studies or networks, to produce reference chemicals and analytical spectra for chemical compound identification and to provide standardization procedures and guidelines for program offices field studies.

Toxic Chemical Testing/Assessment

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CIN	Tom Clark	1,215.5	11
EMSL/LV	Gareth Pearson	1,043.2	35
EMSL/RTP	John Puzak	300.0	12
ADEMQA/HQ	Michael Dellarco	23.8	0

Support for Toxic Substances Control Act (TSCA)

Scientific Assessment

The scientific assessment program provides evaluations and assistance to the Office of Toxic Substances in conducting uniform risk assessment procedures for carcinogenicity, mutagenicity, adverse reproductive and developmental effects, and exposure.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA/HQ	William Farland	115	95

Engineering

Environmental Engineering and Technology Demonstration

This program supports the Office of Toxic Substances in its implementation of TSCA, Asbestos Hazard Emergency Response Act (AHERA), and SARA, Title III. The program focuses on the development of predictive capabilities to be used in assessing release and exposure in the review of Premanufacturing Notices (PMNs) for new chemicals, and the techniques and controls for ensuring clearance of asbestos from buildings to allow for "no risk" reentry in accordance with OTS guidance.

The exposure and release assessment part of this research program has been developed around a systemized unit operations approach to address the manufacturing and processing of new chemical substances. Emphasis has been placed on the frequency and magnitude of exposure in the work place, routes of exposure (dermal, inhalation, and ingestion), and exposure duration. Additional emphasis has been directed toward the release of chemical substances into the workplace environment.

Research in the industrial settings area has been concentrated on those manufacturing scenarios found in the polymer processing industry. Primary emphasis is directed toward exposures associated with the off-gassing of monomers, degradation products, and polymer additives.

Toxic Chemical Testing/Assessment

In the fate assessment of toxic compounds portion of this research program, emphasis has been placed on water soluble compounds which, ultimately are subjected to secondary wastewater treatment, and in particular, activated sludge treatment. Azo dyes and polyelectrolytes were selected by OTS for fate studies due to the high numbers of PMN submissions and because of the limited fate data available.

Agency asbestos guidance has been developed by best engineering judgement. This program attempts to evaluate the effectiveness of any such guidance as early as possible after its release. Guidance includes removal and in situations where the asbestos-containing materials would be left in place operations and maintenance procedures.

Should the ongoing studies indicate that the guidance clearance levels (indoor equals outdoor) can be met, the program will shift toward evaluating more cost-effective technologies and toward addressing the broader area of control technology for all respirable and durable fibers, especially asbestos substitutes. If the studies indicate that existing technologies are inadequate to meet the clearance criteria, the program will address new technologies and defer the respirable and durable fiber program.

To satisfy the needs as expressed in AHERA, research efforts will evaluate transportation and disposal options, and attempt to indicate the "least-burdensome" strategy where several "risk-free" options are possible.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
WERL CI	Clyde Dempsey	896.0	20
	Roger Wilmoth	1,158.6	35
OEETD HQ	Bill McCarthy	42.5	10

Test Method Development

Acid Deposition, Environmental Monitoring, and Quality Assurance

Test method development research seeks to provide improved procedures to identify and quantitate chemical compounds of interest. Emphasis is placed on development of biological and chemical procedures to measure chemicals in different media including pollutant dose in the body and specific environmental media. New statistical techniques are developed for spectra analysis, for field study designs and for population sampling to improve routine monitoring.

Toxic Chemical Testing/Assessment

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CIN	Tom Clark	227.0	26
EMSL/LV	Gareth Pearson	414.7	20
EMSL/RTP	John Puzak	287.5	21
ADEMQA/HQ	Michael Dellarco	92.1	100

Test Method Development

Environmental Processes and Effects

Environmental hazard assessment research focuses on developing, improving and validating single and multi-species toxicity tests for chronic and acute toxicity in aquatic ecosystems. The developed methods are validated in microcosms in the laboratory, and in natural and constructed field ecosystems to define their applicability in real-world situations.

Test methods development for aquatic biota provides new or modified bioassays and is an essential part of hazard assessment. This effort encompasses the cellular level of organisms and includes larger ecosystems to assess how exposure to toxic substances can adversely affect these biological systems. These methods are verified and validated both in the laboratory and in the field using representative chemicals for the assessment of existing chemicals.

Activities in this program are carried out in three field laboratories. Their locations and kinds of research conducted are as follows:

- ERL/Duluth—effects of toxic substances in freshwater environments;
- ERL/Gulf Breeze—fate and effects of toxic chemicals and genetically altered organisms in estuarine/marine systems;
- ERL/Narragansett—chemical fate and effects in marine systems.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/DUL	Gilman Veith	51.4	100
ERL/GB	Henry F. Enos	286.4	100
ERL/NARR	Norbert A. Jaworski	86.4	100

Toxic Chemical Testing/Assessment

Test Method Development

Health Effects

Under the Toxic Substances Control Act, EPA must provide industry with guidance to test chemicals for potential hazards to public health. In order to base regulatory decisions on the best possible data, reliable test methods must be developed for incorporation into test guidelines. The goal of this research is to develop short-term, cost-effective, predictive methods for detecting the toxic effects of chemicals. These test systems include both *in vitro* and *in vivo* methods and bioassays for predicting adverse health effects such as alterations in reproductive and developmental processes and immunotoxic and neurotoxic effects.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	William F. Durham	1,627.5	60
OHR/HQ	Lynda Erinoff		

Test Method Development

Scientific Assessment

The role of the scientific assessment program is to reduce the uncertainties associated with risk assessment by conducting or sponsoring efforts intended to develop and/or improve approaches and methods in this area. Efforts include the development of biologically-based models to extrapolate laboratory-derived data to human risk applications, assessment of risk as a function of different exposure scenarios and the quantification of exposure that incorporates pharmacokinetic/pharmacodynamic factors, and the development of methods that can be directly applied to human populations to assess the occurrence and degree of exposure and estimate the probable health risk.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA HQ	William Farland	304	34

Pesticides

Biotechnology/Microbial and Biochemical Pest Control Agents

Environmental Processes and Effects

This portion of the research program is planned to develop or improve bioassay methodologies for determining the effects of biological control agents or biochemical agents (e.g. hormones, pheromones) on non-target biotic receptors. The application of the results assists in establishing testing guidelines and in registering and controlling the use of these control agents. Agents of interest include both genetically altered and unaltered bacteria, viruses and fungi. Parameters to be studied include routes of exposure, methods to recover or identify the agents and virulence, toxicity and infectivity. Survival, monitoring, growth, persistence and effects plus controlling abiotic factors are of concern. Probable genetic transfer/stability and the risks associated with genetically engineered microorganisms (GEMs) will be investigated. Special handling and testing methods and systems will be studied. Existing extramural monies will be expended through the laboratories.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/COR	Thomas A. Murphy	141.4	100
ERL/DUL	Gilman Veith	97.6	100
ERL/GB	Henry Enos	405.1	100
OEPER/HQ	Frederick Kutz	1,030.2	0

Biotechnology/Microbial and Biochemical Pest Control Agents

Health Effects

Models will be developed on potential interaction of microbial agents and the mammalian cell. Goals are (1) the determination of the ability of microbial agents to replicate, and (2) to provoke immune responses in non-target (mammalian) hosts. Methods will also be developed using monoclonal antibodies and biotinated DNA probes to enable the identification of genetic material from microbial pesticides in non-target sites such as mammalian cells *in vitro* and *in vivo*.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	William F. Durham	903.7	34
OHR/HQ	Charles T. Mitchell		

Pesticides

Ecology: Ecotoxicity and Risk Assessment

Environmental Processes and Effects

To register or re-register pesticides it is necessary to develop a focused risk assessment process for integrating hazard and exposure assessments into models which express the probability of risk to important non-human populations. This facet of the research program develops environmental risk assessment methodology by combining impact data using existing or new models to express risk as a probability with estimates of the associated uncertainty.

New endpoint responses will be studied encompassing ecosystem structures and function. Selected wildlife and microbial populations will be used to reflect population changes and other changes that influence risk evaluations. Other parameters that affect model integrity will be studied (e.g., species susceptibility; chemical routes of exposure and uptake and residues). Modeling will be supported through data integration and the model, its calibration and validation will be supported through field studies which includes all media. Upon completion of the planning cycle all extramural monies will be disbursed through the participating laboratories.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL ATH	Rosemarie C. Russo	0.0	0
ERL COR	Thomas A. Murphy	56.6	100
ERL DUL	Gilman Veith	239.3	100
ERL GB	Henry Enos	0.0	0
OEPER HQ	Frederick Kutz	739.5	0

Ecology: Transport/Fate/Field Validation

Environmental Processes and Effects

Research will concentrate on the development, refinement and validation of techniques and models to measure and predict pesticide transport, degradation, exposure, effects and fate in the environment. Laboratory and field studies will be conducted to substantiate the applicability of methods and mathematical models and to insure that results are valid and reflect environmental responses under natural conditions. Data from these studies will be used to assess pesticide hazards to surrogate species, populations and communities representative of aquatic and terrestrial habitats.

These investigations will include analysis of abiotic influences on study results and on various chemical and physical factors and processes. Sorption, leaching and residues will be evaluated. Ground water contamination and

associated processes will be explored and remedial actions sought. Predictive techniques for exposure concentrations will be improved with studies on pesticide sorption kinetics, transformations and mechanisms of degradation.

Information and data including assessments and predictive tools, evaluations of assessment criteria, reference hand books and manuals, workshops and reviews are transferred to support the Agency's regulatory actions.

Laboratories involved in this research are shown below. Most extramural monies currently retained at Headquarters will be dispersed to the laboratories subsequent to final planning actions.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/ATH	Rosemarie C. Russo	329.8	100
ERL/COR	Thomas A. Murphy	373.3	45
ERL/DUL	Gilman Veith	442.8	54
ERL/GB	Henry Enos	866.0	77
OEPER/HQ	Frederick Kutz	1,062.7	35

Engineering

Environmental Engineering and Technology Demonstration

This program which supports the Office of Pesticide Programs consists of two major areas: protective clothing and disposal technology. A major effort is concluding which will produce a Guidance Manual for "Selecting Protective Clothing for Agricultural Pesticide Operations," serving as a reference document for OPP's use in protective clothing issues related to OPP's regulatory development, implementation, and training activities. The manual will include standard test methods and performance data from both laboratory and field tests. The Manual will serve as a basis for developing documents directed to specific sectors of the user community.

Efforts will be initiated to evaluate existing disposal techniques and processes for destroying specific pesticide compounds for which the Agency has indemnified the manufacturer.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
WERL/CIN	Michael Royer	442.5	35
HWERL/CIN	Ed Bates	2,000.0	25
OEETD/HQ	Bill McCarthy	4.3	5
OEETD/HQ	Kurt Jakobson	4.3	5

Pesticides

Exposure

Acid Deposition, Environmental Monitoring, and Quality Assurance

The Non-Occupational Pesticide Exposure Study (NOPES) is being conducted to develop and test the Total Exposure Assessment Methodology (TEAM) approach for measurement of pesticides used routinely by the general population and seeks to relate exposure of the population to pesticide use patterns involving personal air, food, drinking water, and dermal exposure. This study will evaluate TEAM methods for pesticide exposure and determine if non-occupational pesticide usage in and about homes should be studied further as an important pollutant source.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/RTP	Gerald Akland	300.6	0
ADEMQA/HQ	Lance Wallace	0	0

Health: Markers, Dosimetry and Extrapolation

Health Effects

This research focuses on developing animal models to assess health risks and improve methodology for extrapolating results of animal toxicity studies into risk estimates for humans. Studies will include evaluation of interspecies differences in the dermal absorption of pesticides, examination of structure-activity relationships in teratogenesis, examination of metabolic differences between species which may contribute to teratogenic outcomes, and the investigation of potential interactions between alterations in maternal health status and susceptibility teratogenic exposures. Additionally, a computerized data management system which analyzes genetic data will continue to be developed.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL/RTP	William F. Durham	1,082.4	52
OHR/HQ	Charles T. Mitchell		

Pesticides

Health: Markers, Dosimetry and Extrapolation

Acid Deposition, Environmental Monitoring, and Quality Assurance

A new program is being initiated with the goal of relating external dose to internal dose and to early indicators of disease states resulting from exposure to pesticide residues. Research studies are being carried out to define the relationship between biological indicators of exposure as well as studies in dosimetry and extrapolation related to genetically mediated health effects.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/LV	R.K. Mitchum	262.0	12
ADEMQA/HQ	Michael Dellarco	0.0	0

Support

Acid Deposition, Environmental Monitoring, and Quality Assurance

The pesticides quality assurance program ensures the accuracy of the data which is attained through testing and analysis. This program maintains a pesticide repository of high purity chemicals which are used by more than 1,400 laboratories in the United States and in foreign countries. These samples are used as standard reference samples for internal quality control. In addition, interlaboratory comparison samples are prepared. Also, the program will provide samples of pesticide chemicals no longer produced, but still regulated, in the United States. Such reference samples are necessary to perform analyses in soil, plant, or animal tissues at the required degree of accuracy.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/LV	R. K. Mitchum	902.4	42
ADEMQA/HQ	Michael Dellarco	0.0	0

Test Method Development

Environmental Processes and Effects

Laboratory studies will develop, improve and validate bioassay methodologies to be used as standardized pesticide testing protocols for marine/estuarine organisms. Various methods will be geared to testing chosen life stages of representatives or surrogate test species for long-term or short-term durations. These methods will assess both exposure and effects of pesticides under acute and chronic conditions and some may be used for monitoring particular pesticides or sensitive biota and for predicting response. Influencing environmental factors

which may modify testing results will be studied to establish confidence limits for the methods under given conditions. The methods will contribute to establishing or modifying pesticides testing guidelines.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL GB	Henry F. Enos	253.2	100

Test Method Development

Health Effects

This research involves developing and refining bioassays for the detection of adverse alterations in the development of reproductive processes in animals which allow for more accurate evaluations of reproductive development and function. Techniques are also being developed, validated, refined and implemented for determining human genetic effects caused by exposure to chemical carcinogens and mutagens. Additionally, methods are being developed to refine the relationship between biological indicators of neurotoxicity and disease as well as methods development in the area of immunotoxicology.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL RTP OHR HQ	William F. Durham Charles T. Mitchell	1,913.3	64

Test Method Development

Scientific Assessment

The scientific assessment program carries out specific risk assessment work in direct support of the Office of Pesticide Programs, prepares and reviews guidelines for Agency-wide application in conducting risk assessments, and seeks to reduce the uncertainties in risk assessment techniques and methods. Assessment methods are being reviewed and updated to address program-specific problems, including data gathering and analysis of heritable risks from low-dose exposures. Research is also underway to evaluate human reproductive dysfunction, which may result from exposure to chemicals.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA HQ	William Farland	527	31

Multi-Media Energy

Develop and Evaluate LIMB Technology

Environmental Engineering and Technology Demonstration

This area is supporting the evaluation of alternative acid rain control technologies research: specifically the development of commercialization of an integrated NO_x/SO_2 control technology—The Limestone Injection Multistage Burner (LIMB).

The LIMB control technology can substantially reduce both NO_x and SO_2 emissions while at the same time reducing the costs for control. A systematic development is underway to bring the LIMB technology to the point where industry would be willing to commercialize it. The 1988 program will include: research on sorbent reaction mechanisms, prototype scale testing of the tangentially-fired experimental systems for extrapolating the performance to commercial scale, detailed analysis to identify potential operability and reliability problems, and operation and testing of the industry/EPA cofunded full scale demonstration on wall-fired utility boiler.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
AEERL/RTP	Jim Abbott	3,313.0	34
OEETD/HQ	Marshall Dick	347.3	51

Establish Deposition Monitoring Data Base

Acid Deposition, Environmental Monitoring, and Quality Assurance

Development, testing, and intercomparing of field and laboratory techniques for measuring dry deposition will continue. Among those techniques are the transition flow reactors, annular denuder, Canadian filter pack, eddy accumulator, coarse particle collector, time of wetness sensors, and FTIR. A project whose goal is to quantify the subgrid variability of dry deposition is underway and will be expanded. By the end of FY88 approximately 60 dry deposition sites will be operational.

In the wet deposition area, development of better wet collectors (buckets) and determining snow chemistry representativeness and comparing rain gauges will have high priority. Quality assurance, data systems support, and analyses of spatial and temporal variation of data are an integral part of the program.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/RTP	Steven Bromberg	4,627.4	5.2
ADEMQA/HQ	Barbara Levinson	1,427.6	1.9
ASRL/RTP	Ken Knapp	281.5	37.3

Multi-Media Energy

Estimate Emissions from Man-Made Sources

Acid Deposition, Environmental Monitoring, and Quality Assurance

This research effort gives primary emphasis to the development of a high quality emissions data base for calendar year 1985. SO_2, NO_x, and VOC are the emission species of principal interest. Models to forecast emission trends and costs of various control programs are being developed. These economic sectoral models and the emissions inventories will be used to support regional and national policy analysis and assessment.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
AEERL/RTP	Michael Maxwell	3,410.4	35
ADEMQA/HQ	John Malanchuk		

Evaluate Availability and Cost of Applicable Control Technology

Acid Deposition, Environmental Monitoring, and Quality Assurance

This program assesses the engineering and economic potential of emerging technologies for removing acid deposition precursors from combustion sources. The work considers non-hardware approaches such as fuel switching as well as retrofit technologies such as the limestone injection multi-stage burner, E-SO_x and duct injection.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
AEERL/RTP	Julian Jones	623.0	35
ADEMQA/HQ	John Malanchuk	375.0	0

Understand and Quantify Effects on Material and Cultural Resources

Acid Deposition, Environmental Monitoring, and Quality Assurance

The theoretical damage function for galvanized steel will be validated against field data. Chamber and field studies for paint/substrate systems will continue. The inventory for galvanized steel will be completed and the inventory for painted surfaces will continue. An intracity time of wetness study will be completed.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ASRL/RTP	John Spence	1,766	4.02
ADEMQA/HQ	Barbara Levinson	701	12.1
EMSL/LV	John Worlund	200	0.0

Multi-Media Energy

Understand and Quantify Aquatic Effects

Acid Deposition, Environmental Monitoring, and Quality Assurance

The Aquatic Effects Research Program comprises the following activities: (1) Classification of sensitive waters and watersheds based on the analysis of the National Surface Water Survey data bases; (2) formulation of predictive regional aquatic chemistry models which incorporate episodic and non-episodic events; (3) development of biological response models for fish populations and other aquatic biota; (4) assessment of drinking water quality and possible health effects due to toxic metal mobilization and bioaccumulation in fish; (5) expansion of the Direct/Delayed Response Project (DDRP) research to include the transition Middle Atlantic region project; (6) operation of a prototype intensively studied watershed site in Maine to collect data for use in testing predictive models of watershed response to acid deposition; and (7) initiation of a program to detect incipient changes in sensitive surface waters and watersheds.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ERL/COR	Robert A. Lackey	11,095	4
EMSL/LV	Robert Schonbrod	3,145	8
EMSL/RTP	Rick Linthurst	175	52
ADEMQA/HQ	Rick Linthurst	2,988	4
ASRL/RTP	Jack Durham	125	22
ERL/DUL	John G. Eaton	390	5
EMSL/CI	Cornelius Weber	350	15

Understand and Quantify Terrestrial Effects

Acid Deposition, Environmental Monitoring, and Quality Assurance

Research will be performed at several integrated, multi-disciplinary intensive research sites in spruce/fir, southern commercial, eastern hardwood, and western coniferous forest types. The effects of acidic deposition alone or in combination with associated pollutants will be considered in the light of hypothesized mechanisms. A vegetation survey and a central synthesis and integration activity will be undertaken in support of this research.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/RTP	Dick Paur	3,268.1	3.0
ERL/COR	Robert A. Lackey	6,868.1	2.7
ADEMQA/HQ	Don Cook	1,653.6	20.1

Multi-Media Energy

Understand Atmospheric Processes

Acid Deposition, Environmental Monitoring, and Quality Assurance

This research is designed to improve our capability to examine and predict the atmospheric transport, chemical transformation and the wet and dry deposition of acidic substances emitted into the atmosphere. Laboratory and field studies, using chemical tracers of emissions, recently developed gas measuring instruments, and extensive monitoring is being undertaken to study the movement and transformation of acids and their precursors from sources to receptors. Modules which mathematically simulate the atmospheric processes are being developed for the Regional Acid Deposition Model (RADM). A major field program has been planned to test and evaluate RADM.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ASRL RTP	H. M. Barnes	9,648.9	6
ADEMQA HQ	Dennis Trout		

Manage the Mandatory Quality Assurance Program

Acid Deposition, Environmental Monitoring, and Quality Assurance

A significant portion of EPA's budget is spent on collecting environmental data. Quality assurance (QA) activities play an integral role in the planning and implementation of environmental data collection efforts and in the evaluation of the resulting data. By means of their QA programs, EPA organizations can enjoy substantial resource savings, because they collect only those data that are needed, and because they can be sure that the data they collect are of the requisite quality.

Quality assurance is the process of *management* review and oversight at the planning, implementation, and completion stages of an environmental data collection activity to assure that data provided by a line operation to data users are of the quality needed *and* claimed. Quality assurance should not be confused with quality control (QC); QC includes those activities required *during* data collection to produce the data quality desired and to document the quality of the collected data (e.g., sample spikes and blanks).

Quality assurance programs consist of specific activities conducted before, during and after environmental data collection. During the planning of an environmental data collection program, QA activities focus on assuring that the quality of the data needed by data users has been defined, and that a QC system has been designed for measuring the quality of the data being collected. During the implementation of a data collection effort, QA activities ensure that the QC system is operating and that problems found by QC are corrected. After environmental data are collected, QA activities focus on assessing the quality of the data obtained. Here, one determines whether the data obtained are adequate to support data-dependent regulatory decisions or research hypotheses.

The Quality Assurance Management Staff (QAMS) is charged with overseeing the quality assurance activities of the Agency. QAMS came into being in May 1979, when the Agency recognized the need for formalizing an Agency-wide quality assurance program for all environmental data collection activities. More recently, with the issuance of EPA Order 5360.1 in April 1984, the Agency's quality assurance program has been significantly strengthened and broadened. The Order mandates that QA be an integral part of all environmental data collection activities, from planning through implementation and review.

The Order identifies the activities basic to the implementation of a QA program. These include:

- requiring QA in all Agency-supported environmental data collection activities,
- defining Data Quality Objectives,
- developing quality assurance program and project plans,
- conducting audits,
- implementing corrective actions based on the audits,
- establishing achievable data quality limits for methods cited in EPA regulations,
- developing and adopting technical guidelines for assessing data quality, and
- providing for QA training.

In recent years, the Agency's QA activities have focused on identifying the basic elements that are essential to effective quality assurance for environmental data. QAMS has put considerable emphasis on issuing guidance defining these key elements and describing their importance in the efficient and effective expenditure of resources assigned to environmental data collection. This guidance development phase is now essentially complete, and in FY 1988 QAMS will proceed with full-scale implementation support and oversight.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ADEMQA HQ	Stanley Blacker	1,712.8	48

Manage Visiting Scientists Program

Exploratory Research Core Program

The Visiting Scientists Program has two components: a competitive visiting scientists and engineers program and a summer fellowship program. The objective of the Visiting Scientists and Engineers Program is to attract accomplished visitors into the Agency for 1 to 3 years to assist in strengthening the Agency's science policy and research program. Candidates are sought through annual advertisements in nationally known scientific and engineering publications. They are then subjected to a peer review process from which only the top candidates are recommended for assignment to an EPA laboratory. In FY 1987, one visiting scientist was assigned to EPA.

The Summer Fellows Program is carried out in cooperation with the American Association for the Advancement of Science and sponsors the assignment of post-doctoral environmental science and engineering fellows to EPA facilities for the summer months to conduct environmental research projects. In FY 1987, 10 highly qualified fellows were sponsored.

Intermedia

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OER/HQ	Roger Cortesi	400	0

Manage Exploratory Research Grant and Centers Program

Exploratory Research Core Program

This program has two major components: the Research Grants Program and the Environmental Research Centers Program. The Research Grants Program supports research initiated by individual investigators in areas of priority interest to the Agency. Research proposals are solicited via two mechanisms: (1) the general "Solicitation for Research Proposals" which is published each year and invites proposals in broadly defined areas of environmental science and engineering, and (2) the Request for Applications (RFA) which is a more targeted solicitation mechanism which requests proposals in well-defined areas of particular interest to the Agency. All proposals received in response to either mechanism are subjected to a rigorous peer panel review. In addition, those responding to the general solicitation must undergo an Agency relevance review. Areas in which research proposals will be requested in FY 1988 under the general solicitation include: environmental biology, environmental health, environmental engineering and environmental chemistry and physics.

In an effort to provide more support to minority institutions for the conduct of basic environmental research, the Research Grants Program makes available pre-application assistance for minority faculty at Historically Black Colleges and Universities through its Minority Institutions Assistance Program. Whether or not this assistance is used, however, research proposals received under this program are reviewed along with proposals received under the general solicitation and in accordance with the standards applied thereto. The Research Centers Program supports multidisciplinary research which is conducted in a university setting and focuses in areas of priority interest to EPA. For FY 1987, the following eight university research centers were sponsored:

Waste Elimination Research Center (Illinois Institute of Technology): study innovative technology and process modification to reduce industrial pollutants.

Intermedia Transport Research Center (University of California—Los Angeles): define chemical/physical processes governing pollutant exchange at air-land and air-water boundaries.

Intermedia

Ecosystems Research Center (Cornell University): identify and apply ecosystem principles to environmental management problems.

Marine Sciences Research Center (University of Rhode Island): assess marine ecosystems health, emphasizing exposure of marine organisms to toxics.

Advanced Control Technology Research Center (University of Illinois): study separation technology, thermal destruction, biological separation, and chemical detoxification.

Ground Water Research Center (University of Oklahoma, Oklahoma State University, and Rice University): study subsurface characterization, transport and fate, and groundwater horizon modeling.

Epidemiology Research Center (University of Pittsburgh): study basic epidemiology methods and airborne particulate health effects.

Hazardous Waste Research Center (Louisiana State University): study the design, construction, maintenance, operation, and closure of hazardous waste landfills.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OER HQ	Roger Cortesi	15,042	4

Integrated Risk Assessment

Scientific Assessment

The scientific assessment program provides uniform Agency-wide guidance on, and assures the consistency of, exposure and risk assessments that support regulatory decision making by EPA.

The program consists of three components—risk assessment guidelines, the Risk Assessment Forum, and the Integrated Risk Information System. The Office manages development of Agency-wide risk assessment guidelines. Guidelines for assessing risks to the female and male reproductive systems, risks from systemic toxicants, making and using exposure measurements, and for pharmacokinetics are under development. The guidelines published in 1986 will be updated as appropriate.

The Office provides management and technical coordination for the Risk Assessment Forum, a group of senior scientists who meet regularly to promote consensus on risk assessment issues and to ensure that this consensus is incorporated into appropriate risk assessment guidance.

The Office also manages the Integrated Risk Information System (IRIS), an Agency-wide readily accessible E-mail information system organized on a chemical-by-chemical

basis. The Office coordinates the Agency-wide work groups who review the technical information for consistency and quality and maintains the system itself.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA/HQ	Dorothy Patton	2,237	58

Small Business Innovation Research (SBIR) Program

Exploratory Research Core Program

Public Law 97-219 requires EPA to devote 1.25% of its extramural research and development budget to Small Business Innovation Research (SBIR). The SBIR Program funds, via contracts, small businesses with ideas relevant to EPA's mission. The program focuses exclusively on projects in control technology or process instrumentation development. Proposals are solicited in the fall of each year for Phase I research. Phase I research consists of feasibility studies which are supported at a level up to $50,000. Of these Phase I studies, the best are selected for Phase II studies where actual product development is started. Phase II studies are supported up to a level of $150,000. To date, half of the Phase I efforts have been supported in Phase II. Results from the SBIR Program are expected to lead to the commercial development of a product or process used in pollution control. In fiscal year 1987 the SBIR budget was about three million dollars.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OER/HQ	Walter Preston	2,500	0

Radiation

Off-Site Monitoring Program

Acid Deposition, Environmental Monitoring, and Quality Assurance

The overall goal of the research program is to provide the scientifically credible data necessary to assess public exposure to non-ionizing radiation and to man-made radioactive materials and to allow decisions to be made regarding control of that exposure.

In addition, this program provides quality assurance for the Agency's programs for monitoring radiation in the environment. These are supported by providing a common source of radionuclides standards and reference materials and through the conduct of laboratory intercomparison studies to assure data of known quality from analyses of environmental samples such as milk, water, air and food.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL LV	Charles Costa	162.5	100
ADEMQA HQ	Michael Del Greco	0.0	0

Scientific Support for Radon Program

Environmental Engineering and Technology Demonstration

The engineering program for radiation primarily supports the Agency's Radon Action Program. It is directed at developing and testing cost-effective methods for reducing radon in homes. The results of these tests, along with analysis of the findings of others, are provided to the States, private sector organizations (such as builders and contractors), and to homeowners. The research will continue to extend the number of techniques, the housing substructure types and the locations for testing. The research focuses primarily on mitigation in existing homes, although techniques applicable to prevention in new house construction will also be assessed.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
AEERL RTP	Alfred B. Craig	1,526.3	54
OEETD HQ	Paul Shapiro	170.3	68

Superfund

Provide Techniques and Procedures for Site and Situation Assessment

Acid Deposition, Environmental Monitoring, and Quality Assurance

The success of removal and remedial actions depends on an accurate definition of the kinds and severity of the problem. The latest protocols, techniques, and instrumentation for sampling and analysis and remote monitoring must be applied to provide the decision maker with scientifically accurate information. Remote sensing and geographical information systems will provide valuable data for analysis of present and historical site operations and conditions at sites. A sampling program should include a review of protoco's and field operations as well as site specific sampling plans. Protocols, techniques and methods of monitoring will be evaluated and demonstrated. Air monitoring techniques and equipment will be evaluated to provide source monitoring methods at sites. Geophysical techniques and interpretation strategy will be evaluated.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CI	Robert Booth	459.4	47
EMSL/RTP	John Puzak	280.1	17
EMSL/LV	Robert Snelling	2,026.2	23
ADEMQA/HQ	John Koutsandreas	481.1	23

Provide Techniques and Procedures for Site and Situation Assessment

Scientific Assessment

Site-, chemical- and situation-specific exposure and risk assessments are being prepared to assist the program office and Regions in evaluating the alternative courses of actions and regulatory strategies that might be applied at uncontrolled Superfund sites. Activities include development of health and environmental effects documents for the chemicals most frequently found at candidate sites, participation in the development of toxicological profiles, and provision of rapid response health assessments on short turnaround.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
ECAO/CIN	Christopher DeRosa	649	59

Superfund

Clean-up of Uncontrolled Hazardous Waste Sites Requires Technologies for Response and Remedial Action, for Protecting the Personnel Involved and for Supporting Enforcement Actions

Environmental Engineering and Technology Demonstration

The R&D support program develops and evaluates clean-up technology, demonstrating proto-type equipment such as mobile incineration systems and mobile soil washing systems. Remedial technology will be assessed and technical reports provided which will include design data, and cost information. Engineering expertise will be applied to the assessment of uncontrolled hazardous waste site situations to assist the Office of Emergency and Remedial Response, Regions and others in the development of corrective measure options. Manuals will be developed establishing personnel safety protocols and evaluating equipment and techniques, especially for decontamination of equipment and personnel. In addition, short-term, quick turn-around technical advice and consultation will be provided to the regional programs and the Office of Waste Programs Enforcement for enforcement support.

The Superfund Innovative Technology Evaluation (SITE) program has been established to enhance the development and demonstration, and thereby establish the commercial availability, of innovative technologies as alternatives to containment systems. The primary goal of the SITE program is to field evaluate these technologies at Superfund sites in order to develop reliable cost and performance data.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HWERL/CIN	R. Hill I. Wilder	31,245.2	9
OEETD/HQ	R. Thacker	508.0	51

Provide Quality Assurance— Superfund Program Requirements

Acid Deposition, Environmental Monitoring, and Quality Assurance

The success of remedial actions at Superfund sites depend on the provision of state-of-the-art techniques. A quality assurance program must provide the basis for gathering data of known quality for use in making operations decisions

The quality assurance program will provide support to the National Contract Laboratory Program which is responsible for all contract chemical analyses under the Superfund program. In addition, a quick turn-around referee laboratory will be available for Regions and the

Emergency Response Team. The quality assurance program for the National Contract Laboratory Program will provide method and protocol evaluation, reference materials, performance evaluations, data audits, on-site laboratory evaluations, and data automation/data base activities.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CI	Robert Booth	719.1	20
EMSL/LV	Robert Snelling	4,077.7	17

Provide Technical Support to Enforcement, Program, and Regions

Acid Deposition, Environmental Monitoring, and Quality Assurance

All clean-up projects under Superfund have potential enforcement requirements. Services covering sampling and analytical quality assurance and review of monitoring plans for all media will be provided. Site monitoring support for air, surface and ground water, and soils will be provided to the program offices and Regions. Data and reports will be delivered to cognizant offices on an as-requested basis. Geophysical monitoring capabilities will be employed in support of the Regions and the Environmental Response Team.

A comprehensive technical information transfer program will provide data in all phases of monitoring, sampling, and quality assurance to Regions and States. Technical support provided includes information on sampling methodology and quality assurance plans, provision of quality assurance/quality control materials, groundwater sampling and network design, on-site laboratory evaluations, field audits of sampling activities, and technical assistance in conducting geophysical surveys and establishing geographical information systems.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL/CI	Robert Booth	429.9	26
EMSL/RTP	John Puzak	411.1	23
EMSL/LV	Robert Snelling	1,502.7	19

Provide Technical Support to Enforcement, Program and Regional Offices

Scientific Assessment

Site- and chemical-specific health assessments are being provided to support enforcement office needs for the remedial planning and cost recovery efforts. Assessments

provided range from brief hazard summaries to detailed and peer-reviewed documents used in negotiations and litigation.

This office also coordinates review of risk assessments forwarded by Regional Offices to Headquarters for evaluation of consistency, technical quality, and adherence to Agency risk assessment guidelines. The office also serves as a focal point for providing technical support on risk assessments to the states and regions.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA/HQ	Kevin Garrahan	654	42

Hazardous Substance Health, Risk and Detection

Acid Deposition, Environmental Monitoring, and Quality Assurance

The Office of Acid Deposition, Environmental Monitoring and Quality Assurance (OADEMQA) is developing and evaluating monitoring techniques and systems which are rapid and inexpensive, fill technical voids, integrate monitoring systems into multi-media site assessments, and are specific, selective or sensitive. Research in this area will focus on the development, evaluation and standardization of field analytical and sampling methods. New screening methods for single compounds or for classes of compounds using immunoassay systems will be developed. Existing field portable systems will be evaluated and standardized for immediate use. Emerging methods and field portable systems such as fiber optic chemical sensors will be developed, evaluated and standardized.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL LV	Robert Snelling	1,300.0	0
ADEMQA HQ	Thomas Baugh	250.0	0

Hazardous Substances Health Effects/Risk Assessment and Detection Research

Scientific Assessment

This program fulfills, in part, the Agency's responsibilities under the new Section 311(c) to establish a research program to assess, detect and evaluate effects on, and risk to, human health from hazardous substances. It enhances the Agency's internal research capabilities relative to CERCLA assessment activities. The scientific assessment research program, specifically, is integrated with the health effects program, and is developing data and procedures to fill information and

assessment gaps which exist in the various phases of the Superfund public health evaluation process. Areas of specific expertise in this program include development of predictive techniques for reducing uncertainties in reproductive risk assessment and carcinogen risk assessment; development of appropriate techniques for investigating specific areas of chemical mixtures research (i.e., developing toxicological models to predict interactions, identifying contaminant classes that may yield additive, synergistic or antagonistic responses, and statistical methods for analyzing data sets); and developing approaches for integrating exposure information from various sources into risk assessments.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA/HQ	Hal Zenick	2,196	9

Hazardous Substances Health Effects/Risk Assessment and Detection Research

Health Effects

Research develops data and methods to address risk uncertainties in the Superfund public health evaluation process. This process involves assessment of toxicity, exposure, and dose and characterization of risk. The research provides improved health evaluation measures to detect, assess, and evaluate the risks to human health from hazardous substances as needed for Superfund removal and remedial cleanup decisions.

Research will develop test methods needed to evaluate the hazard potential of waste mixtures, screening techniques for early detection of adverse health effects, and improved measurement of health endpoints particularly non-cancer endpoints such as reproductive effects and neurotoxicity. Predictive techniques that can reduce the uncertainties in risk assessment caused by data limitations will be developed and site-specific data will be generated in response to requests from the Office of Emergency and Remedial Response and the Office of Waste Programs Enforcement. Three research themes for improving evaluation of risk and reducing uncertainties in its assessment will be emphasized: bioavailability/pharmacokinetics, interactions of compounds in chemical mixtures, and non-cancer health effects.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
HERL	Judy Graham	3,745.0	11
OHR/HQ	Wade Talbot		

Superfund

Support Reportable Quantity Regulatory Efforts

Scientific Assessment

Chemical-specific data are being provided on carcinogenicity and chronic effects to support the program office activities necessary to adjust, by regulation, the Reportable Quantities for hazardous substances. These include completion of the original CERCLA hazardous substance list and the Extremely Hazardous Substances List, as well as listings in association with Section 3001 of RCRA support for designation of new substances, and review of old RQ calculations.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
OHEA HQ	Alan Ehrlich	830	32

Innovative/Alternative Technology Research, Development, and Demonstration

Acid Deposition, Environmental Monitoring, and Quality Assurance

Newly developed monitoring technologies will be demonstrated for feasibility and applicability to Superfund issues. Industry has developed several new monitoring technologies which have promising applicability to Superfund problems but lack full-scale detailed scientific demonstrations. Industry is expected to pay the cost of the demonstration, or cost share with EPA. For those successful demonstrations, EPA will pay the cost for the required evaluation, and validation of the technology's application to Superfund problems. Superfund legislation calls for the development of technologies which assess the extent of contamination, as well as identify the chemical and physical character of the contaminants at sites. Examples of such technologies include fiber optics sensors and immunoassay systems.

Office or Laboratory	Contact	Total Funds ($k)	Percent In-House
EMSL, LV	Robert Snelling	844.1	11

ORD Organization

The Office of Research and Development is responsible for research, development, and demonstration programs in pollution sources, fate, and health and welfare effects; waste management and utilization technology; environmental sciences; and monitoring systems. Please note, the list below includes both commercial (CML) and Federal (FTS) telephone numbers. Where only one number is listed, it serves both purposes.

Assistant Administrator for Research and Development

Vaun Newill — (202) 382-7676
Headquarters, Washington, DC (RD-672)

Deputy Assistant Administrator

Erich Bretthauer — (202) 382-7676

Senior ORD Official, Cincinnati

Francis T. Mayo — CML (513) 569-7951
Cincinnati, OH 45268 — FTS 8-684-7951

Support Services Office
Director, Robert N. Carr — CML (513) 569-7966
FTS 8-684-7966

Senior ORD Official, Research Triangle Park

F. Gordon Hueter — CML (919) 541-2106
Research Triangle Park, NC 27711 — FTS 8-629-2106

Support Services Office — CML (919) 541-2613
Director, Paul Kenline (MD-51) — FTS 8-629-2613

Office of Research Program Management

Director, Clarence E. Mahan — (202) 382-7500
Headquarters, Washington, DC (RD-674)

Office of Exploratory Research

Director, Roger Cortesi — (202) 382-5750
Headquarters, Washington, DC (RD-675)

Research Grants Staff
Director, Robert A. Papetti — (202) 382-7473

Research Centers Program
Director, Robert A. Papetti — (202) 382-7473

Visiting Scientists Program
Coordinator, Alvin Edwards — (202) 382-7473

Office of Health Research

Director, Ken Sexton — (202)382-5900
Deputy Director, (Vacant)
Headquarters, Washington, DC (RD-683)

Program Operations Staff
Director, Tom Veirs (202) 382-5891

Environmental Health Research Staff
Director, John R. Fowle (202) 382-5893

Health Effects Research Laboratory
Director, F. Gordon Hueter (MD-51) CML (919) 541-2281
FTS 8-629-2281

Office of Acid Deposition, Environmental Monitoring, and Quality Assurance

Director, Courtney Riordan (202) 382-5767
Deputy Director, Matthew Bills
Headquarters, Washington, DC (RD-680)

Program Operations Staff
Director, Paul Palm (202) 382-5761

Quality Assurance Management Staff
Director, Stanley Blacker (202) 382-5763

Environmental Monitoring Systems Division
Director, Charles Brunot (202) 382-5776

Acid Deposition and Atmospheric Research Division
Director, Gary J. Foley (202) 475-8930

Environmental Monitoring Systems Laboratory
Director, Vacant (MD-75) CML (919) 541-2106
Deputy Director, John C. Puzak FTS 8-629-2106
Research Triangle Park, NC 27711

Environmental Monitoring and Support Laboratory
Director, Robert L. Booth CML (513) 569-7301
Deputy Director, Thomas A. Clark FTS 8-684-7301
Cincinnati, OH 45268

Environmental Monitoring Systems Laboratory
Director, (Vacant) CML (702) 798-2525
Deputy Director, Robert N. Snelling FTS 8-545-2525
P.O. Box 93478
Las Vegas, NV 89193-3478

Vint Hill Station
Director, John Montanari CML (703) 347-6224
P.O. Box 1587, Building 166 FTS 8-557-3110
Warrenton, VA 22186

Atmospheric Sciences Research Laboratory
Director, A. H. Ellison CML (919) 541-2191
Deputy Director, Jack H. Shreffler FTS 8-629-2191
Research Triangle Park, NC 27711

Office of Health and Environmental Assessment

Director, Peter W. Preuss (202) 382-7317
Headquarters, Washington, DC (RD-689)

Program Operations Staff
Director, Barry Goldfarb (202) 382-7311

Cancer Assessment Group
Director, William Farland (202) 382-5898

Exposure Assessment Group
Director, Michael Callahan (202) 475-8909

Reproductive Effects Assessment Group
Acting Director, William Farland (202) 382-7303

Environmental Criteria and Assessment Office
Director, Lester Grant (MD-52) CML (919) 541-4173
Research Triangle Park, NC 27711 FTS 8-629-4173

Environmental Criteria and Assessment Office
Acting Director, Steven D. Lutkenhoff CML (513) 569-7531
Cincinnati, OH 45268 FTS 8-684-7531

Office of Environmental Engineering and Technology Demonstration

Director John H. Skinner (202) 382-2600
Headquarters, Washington, DC (RD-681)

Program Operations Staff
Director, Stephen Jackson (202) 382-2580

Technical Programs Division
Director, Darwin R. Wright (202) 382-5747

Air and Energy Engineering Research Laboratory
Director, Frank Princiotta (MD-60) CML (919) 541-2821
Deputy Director, Chick Craig FTS 8-629-2821
Research Triangle Park, NC 27711

Hazardous Waste Engineering Research Laboratory
Director, Thomas R. Hauser CML (513) 569-7418
Deputy Director, (Vacant) FTS 8-684-7418
Cincinnati, OH 45268

Release Control Branch
Director, Ira Wilder CML (201) 321-6600
Edison, NJ 08817 FTS 8-340-6600

Water Engineering Research Laboratory
Director, Francis Mayo CML (513) 569-7951
Deputy Director, Lou Lefke FTS 8-684-7951
Cincinnati, OH 45268

Office of Environmental Processes and Effects Research

Director, James W. Falco (202) 382-5950
Deputy Director, Michael W. Slimak
Headquarters, Washington, DC (RD-682)

Program Operations Staff
Director, Patricia M. Neuschatz (202) 382-5962

Planning and Evaluation Staff
Director, Fredrick W. Kutz (202) 382-5967

Field Laboratories

Robert S. Kerr Environmental Research Laboratory
Director, Clinton W. Hall CML (405) 332-8800
Deputy Director, (Vacant) FTS 8-743-2224
P.O. Box 1198
Ada, OK 74820

Environmental Research Laboratory
Director, Rosemarie C. Russo CML (404) 546-3134
College Station Road FTS 8-250-3134
Athens, GA 30613

Office of Research Operations CML (404) 546-3145
Director, Robert R. Swank FTS 8-250-3145

Office of Program Operations CML (404) 546-3127
Director, Roger K. NeeSmith FTS 8-250-3127

Environmental Research Laboratory
Director, Thomas A. Murphy CML (503) 757-4601
Deputy Director, James C. McCarty FTS 8-420-4601
200 SW 35th Street
Corvallis, OR 97333

Environmental Research Laboratory
Director, Gilman D. Veith CML (218) 727-6692
Associate Director for Research, FTS 8-780-5550
Philip M. Cook
6201 Congdon Boulevard
Duluth, MN 55804

Monticello Field Station CML only
Box 500 (612) 295-5145
Monticello, MN 55362

Large Lakes Research Station CML (313) 675-5000
9311 Groh Road FTS 8-226-7811
Grosse Ile, MI 48138

Environmental Research Laboratory
Director, Norbert A. Jaworski CML (401) 782-3001
Deputy Director, Richard L. Garnas FTS 8-838-6001
South Ferry Road
Narragansett, RI 02882

Hatfield Marine Science Center CML only
Newport, OR 97365 (503) 867-4041

Environmental Research Laboratory
Director, Henry F. Enos CML (904) 932-5333
Deputy Director, Andrew J. McErlean FTS 8-686-9011
(on Rotational Assignment in Region III)
Special Assistant to the Director,
Raymond G. Wilhour
Sabine Island
Gulf Breeze, FL 32561

ORD Organizational Descriptions

Office of Exploratory Research

The Office of Exploratory Research (OER) is responsible for planning, administering, managing and evaluating EPA's exploratory research program in general and, in particular, its extramural grant research in response to Agency priorities as established by Agency planning mechanisms. Its basic objective is to support research aimed at developing a better basic scientific understanding of the environment and its inherent problems. OER accomplishes this objective through four core programs: a Competitive Research Grants Program, an Environmental Research Centers Program, a Visiting Scientists Program and a Small Business Innovation Research Program. Separate descriptions of these programs are provided elsewhere in this research guide. In addition to the core programs, OER administers other programs which are not supported by research and development funds but are nonetheless important to the accomplishment of the OER objective. They include:

- A Minority Fellowship Program which awards fellowships to college seniors and graduate students enrolled on a full-time basis at Historically Black Colleges and Universities and majoring in curricula that could be applied to the solution of environmental problems.
- A Minority Summer Intern Program which extends to recipients of fellowships under the Minority Fellowship Program the opportunity for on-hands experience in the area of their academic training by way of a summer internship at an EPA or other environmental facility. (Both the Minority Fellowship Program and the Minority Summer Intern Program are components of the Minority Institutions Assistance Program, which is briefly described elsewhere in this document.)
- The Agency's Senior Environmental Employment Program (SEE) which utilizes the skills and talents of older Americans to meet employment needs of environmental programs.
- The Federal Workforce Training Program which coordinates ORD's participation in workforce training programs used by state and local governments.

Office of Environmental Engineering and Technology Demonstration

The Office of Environmental Engineering and Technology Demonstration is responsible for the assessment and the development of methods for control of the environmental and socio-economic impacts of municipal and industrial operations and of energy and mineral resource extraction, processing, conversion, and utilization systems. *The Hazardous Waste Engineering Research Laboratory* in

Cincinnati, Ohio, investigates ways to prevent, control, and treat hazardous wastes and Superfund related activities. This includes defining and characterizing sources of pollution, catalyzing advances in the state-of-the-art of pollution control, providing engineering concepts for cost-effective engineering solutions to difficult pollution problems and early-warning of emerging sources of pollution.

The Water Engineering Research Laboratory in Cincinnati, Ohio, investigates, develops and demonstrates cost-effective methods for the treatment and management of municipal wastewater and sludges and urban runoff; and of industrial processing and manufacturing and toxic discharges; and the development of technology and management systems for the treatment, distribution and presentation of public drinking water supplies.

The Air and Energy Engineering Research Laboratory in Research Triangle Park, North Carolina, catalyzes the development of control technologies and process modifications needed to establish and meet standards for air emissions in a timely and cost-effective manner, and supports EPA's regulatory and enforcement programs. The Laboratory also environmentally assesses the manufacture of synthetic fuels and other current and emerging energy sources.

Office of Health Research

The Office of Health Research is responsible for developing and evaluating toxicity test methods and for providing toxicity data to enable the agency to accurately identify hazards and determine human risk from environmental exposure. To fulfill this mission, research is conducted in three major areas:

- Toxicity test method development
- Generation of dose-response data
- Development of methods to use data from toxicity testing and dose-response studies to estimate human morbidity and mortality; including extrapolation from animal data to human effects, from high to low doses, from acute toxicity to long-term effects, and from exposure to dose.

The Health Effects Research Laboratory (HERL) with divisions in Research Triangle Park, North Carolina and Cincinnati, Ohio, conducts research, both intramurally and extramurally, which is responsive to these goals. Physical, biological and chemical agents are studied; and research is conducted in the scientific disciplines of pulmonary

toxicology, genetic toxicology, neurotoxicology, developmental and reproductive toxicology, microbiology, and epidemiology and biometry.

Office of Environmental Processes and Effects Research

The Office of Environmental Processes and Effects Research develops the scientific and technological methods and data necessary to understand, predict, and manage the entry, movement, and fate of pollutants in the environment and the food chain, and to determine the effects of pollutants upon nonhuman organisms and ecosystems.

The Robert S. Kerr Environmental Research Laboratory in Ada, Oklahoma, conducts research on the chemical, physical, and biological processes that affect contaminant transport and transformation in subsurface environments. The focus of the Laboratory's research is on both groundwater quality protection and utilization of the natural assimilative capacity of the subsurface as a waste disposal medium.

The Environmental Research Laboratory in Athens, Georgia, conducts fundamental and applied research required to predict and assess the human and environmental exposures and risks associated with conventional and toxic pollutants in water and soil ecosystems. This research is focused on the identification and characterization of the natural processes and environmental or chemical properties that affect the fate and effects of specific toxic substances, such as pesticides or metals, and on the development of state-of-the-art mathematical models for assessing and managing environmental pollution problems. The laboratory's Center for Water Quality Modeling distributes computer programs for selected models and provides training and assistance for users in government, industry, and academia.

The Environmental Research Laboratory in Corvallis, Oregon, conducts research on terrestrial and watershed ecology and assesses the comprehensive ecological impact of inland pollution and other environmental changes caused by man. This includes the ecological effects of airborne pollutants, such as acid deposition; the effects of toxic chemicals on terrestrial plants, animals, and ecosystems; the assessment and restoration of contaminated or degraded environments; the characterization and assessment of the vulnerability of ecological systems such as wetlands, to human impacts; and the ecological risks from the terrestrial release of bioengineered organisms and other biological control agents.

The Environmental Research Laboratory in Duluth, Minnesota, is primarily responsible for developing water

quality criteria for the Nations' freshwater. Located on Lake Superior, the laboratory specializes in the toxicology of pesticides, industrial chemicals, and other pollutants in freshwater ecosystems. The laboratory has six major research programs to help protect aquatic life. The Great Lakes Program has primary responsibility for describing the fate and effects of pollutants in these waters. The Water Quality Criteria Program develops methods for setting numerical limits for industrial chemicals. The Complex Effluent Program provides cost-effective methods for managing the toxicity of wastewaters. The Structure Activity Program is aimed at developing computer methods for estimating the toxicity and fate of new chemicals from structure rather than testing. The Comparative Toxicology Program develops methods to extrapolate hazard assessment evidence between ecotoxicology and mammalian toxicology. The Ecosystem Effects Program provides methods for ecological risk assessment as well as critical ecosystem property assessment.

The Environmental Research Laboratory in Narragansett, Rhode Island, with its Pacific Division in Newport, Oregon, is the Agency's center for marine, coastal, and estuarine water quality research. The Laboratory's research and development efforts support primarily the EPA Office of Water, responding mainly to legislative requirements of the Clean Water Act, the Marine Protection, Research and Sanctuaries Act, and to a lesser extent, the Toxic Substances Control Act. Major emphasis is placed on providing the scientific base for marine hazard assessment and regulatory activities of that Office.

The Laboratory is responsible for the following research program areas: (1) estuarine and marine disposal and discharge of complex wastes, dredged materials, and other wastes; (2) water use designation and quality criteria for estuarine and marine water and sediment; and (3) environmental assessment of ocean discharges. These research program areas involve the development, evaluation, and application of techniques and test systems for measuring and predicting the transport, fate, and biological and ecosystem effects of complex and other wastes in estuarine and marine systems.

The Environmental Research Laboratory in Gulf Breeze, Florida, is responsible for the following research programs: (1) development of principles and applications of environmental toxicology, including toxic chemical exposure and effects on marine organisms and ecosystem processes; (2) development and evaluation of factors and mechanisms that affect biodegradation rates and bioaccumulation potential in food-webs; (3) development

and verification of methods and data that allow extrapolation from laboratory observations to field situations, and from chemical structure to potential toxicity and biodegradation rates; (4) determination of effects of carcinogens, mutagens, and teratogens in aquatic species (individuals, populations); (5) development of aquatic species and test systems as indicators of environmental and human risk from exposure to chemicals; and (6) development of methods to evaluate environmental risk due to genetically altered microorganisms and other products of biotechnology.

Office of Acid Deposition, Environmental Monitoring, and Quality Assurance

The Office of Acid Deposition, Environmental Monitoring, and Quality Assurance is responsible for: (a) monitoring the cause and effects of acid deposition; (b) research and development on the causes, effects and corrective steps for the acid deposition phenomenon; (c) research with respect to the transport and fate of pollutants which are released into the atmosphere; (d) development and demonstration of techniques and methods to measure exposure and to relate ambient concentrations to exposure by critical receptors; (e) research, development and demonstration of new monitoring methods, systems, techniques, and equipment for detection, identification and characterization of pollutants at the source and in the ambient environment and for use as reference or standard monitoring methods; (f) establishment, coordination, and review of agency-wide Quality Assurance Program; and (g) development and provision of quality assurance methods, techniques and material including validation and standardization of analytical methods, sampling techniques, quality control methods, standard reference materials, and techniques for data collection, evaluation and interpretation.

The Environmental Monitoring Systems Laboratory in Research Triangle Park, North Carolina, develops methods to measure and monitor pollutants in ambient air and emissions sources; operates the quality assurance program for measurement of air pollutants; develops techniques to assess population exposure to air pollutants including total human exposure models and field surveys; conducts research on indoor air pollution; characterizes non-criteria pollutants in air, including air toxics and supervises the air quality monitoring performed in support of forest effects studies including mountain cloud chemistry.

The Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, conducts research and development programs related to monitoring of pollutants in the environment; develops sampling strategies and techniques

for monitoring hazardous waste leachates in soil and groundwater; develops remote sensing techniques; conducts human exposure monitoring and modeling studies covering several environmental media; evaluates analytical methods for the characterization and quantification of hazardous wastes; and provides quality assurance in support of the EPA's hazardous waste, "Superfund," pesticides and ionizing radiation, and acid deposition programs.

The Environmental Monitoring and Support Laboratory in Cincinnati, Ohio, standardizes analytical test procedures to identify and measure major pollutants and microorganisms of health significance in drinking water, ambient receiving waters, and municipal and industrial effluents; operates the quality assurance program for the monitoring data on water pollutants; develops screening methods for use at hazardous waste sites; and provides technical support to water and waste monitoring programs.

The Atmospheric Sciences Research Laboratory in Research Triangle Park, North Carolina, conducts a research program in the physical sciences to detect, define, and quantify air pollution as it relates to urban, regional, and global atmospheres and acid deposition. It is responsible for the development of mathematical models in order to quantitate the relationships between emissions of pollutants from all types of sources, air quality, and atmospheric effects and the characterization of air pollution problems including, but not limited to, acid deposition.

Office of Health and Environmental Assessment

The Office of Health and Environmental Assessment (OHEA) is responsible for assessing the effects of environmental pollutants in varying exposure situations on human health and ecological systems and determining the degree of risks from these exposures. The risk assessments performed by OHEA are used by the Agency as the scientific basis for regulatory and enforcement decisions. OHEA's responsibilities also include the development of risk assessment guidelines and methodologies, and recommendations for new research efforts that will better support future EPA risk assessment activities.

Comprehensive methodologies are prepared for health assessments of both single chemicals and complex mixtures. Technical assistance to various Agency programs and Regional Offices concerning acceptable pollutant levels and dose-response relations are also provided.

The Office includes five organizational groups:

The Environmental Criteria and Assessment Office in Research Triangle Park, North Carolina, is responsible for preparing air quality criteria documents and air pollutant health assessment documents for use in Agency regulatory activities, as well as legislatively required health-related reports.

The *Environmental Criteria and Assessment Office* in Cincinnati, Ohio, prepares health and hazard assessment documents on water pollution and solid and hazardous wastes and hazardous air pollutants.

The *Carcinogen Assessment Group* evaluates the health risks associated with exposure to suspect carcinogens and prepares carcinogen assessments for use in the Agency's regulatory and enforcement decision-making processes.

The *Exposure Assessment Group* provides advice on the exposure characteristics and factors of agents that are suspected of causing detrimental health effects; provides state-of-the-art methodology, guidance, and procedures for exposure determinations; and prepares independent assessments of exposure and recommendations concerning the exposure potential of specific agents.

The *Reproductive Effects Assessment Group* prepares assessments on the risks associated with human exposure to suspect mutagens, teratogens, and agents that cause adverse reproductive effects; is involved in developing testing methods and basic research designed to improve the scientific basis for these assessments; and is active in coordinating research in these interrelated end points.

ORD Office/Laboratory Abbreviations

CERI/CIN Center for Environmental Research Information
Cincinnati, OH 45268
CML (513) 569-7391
FTS 8-684-7391

ECAO/CIN Environmental Criteria and Assessment Office
Cincinnati, OH 45268
CML (513) 569-7532
FTS 8-684-7532

ECAO/RTP Environmental Criteria and Assessment Office
Research Triangle Park, NC 27711
CML (919) 541-4173
FTS 8-629-4173

EMSL/CIN Environmental Monitoring and Support Laboratory
Cincinnati, OH 45268
CML (513) 569-7301
FTS 8-684-7301

EMSL/LV Environmental Monitoring Systems Laboratory
P.O. Box 93478
Las Vegas, NV 89193-3478
CML (702) 798-2100
FTS 8-545-2100

EMSL/RTP Environmental Monitoring Systems Laboratory
Research Triangle Park, NC 27711
CML (919) 541-2106
FTS 8-629-2106

ASRL/RTP Atmospheric Sciences Research Laboratory
Research Triangle Park, NC 27711
CML (919) 541-2191
FTS 8-629-2191

ERL/ATH Environmental Research Laboratory
College Station Road
Athens, GA 30613
CML (404) 546-3134
FTS 8-250-3134

ERL/COR Environmental Research Laboratory
200 SW 35th Street
Corvallis, OR 97333
CML (503) 757-4601
FTS 8-420-4601

ERL/DUL Environmental Research Laboratory
6201 Congdon Boulevard
Duluth, MN 55804
CML (218) 727-6692
FTS 8-780-5550

ERL/GB Environmental Research Laboratory
Sabine Island
Gulf Breeze, FL 32561
CML (904) 932-5311
FTS 8-686-9011

ERL/NARR Environmental Research Laboratory
South Ferry Road
Narragansett, RI 02882
CML (401) 782-3000
FTS 8-838-6000

HERL/RTP Health Effects Research Laboratory
Research Triangle Park, NC 27711
CML (919) 541-2281
FTS 8-629-2281

HWERL/CIN Hazardous Waste Engineering Research Laboratory
Cincinnati, OH 45268
CML (513) 569-7418
FTS 8-684-7418

AEERL/RTP Air and Energy Engineering Research Laboratory
Research Triangle Park, NC 27711
CML (919) 541-2821
FTS 8-629-2821

WERL/CIN Water Engineering Research Laboratory
Cincinnati, OH 45268
CML (513) 569-7951
FTS 8-684-7951

OEETD/HQ Office of Environmental Engineering and Technology Demonstration
(RD-681)
Washington, DC 20460
(202) 382-2600

OEPER/HQ Office of Environmental Processes and Effects Research
(RD-682)
Washington, DC 20460
(202) 382-5950

OER/HQ Office of Exploratory Research
(RD-675)
Washington, DC 20460
(202) 382-5750

OHEA/HQ Office of Health and Environmental Assessment
(RD-689)
Washington, DC 20460
(202) 382-7317

OHR/HQ Office of Health Research
(RD-683)
Washington, DC 20460
(202) 382-5900

OADEMQA/HQ Office of Acid Deposition, Environmental Monitoring, and Quality Assurance
(RD-680)
Washington, DC 20460
(202) 382-5767

RSKERL/ADA Robert S. Kerr Environmental Research Laboratory
P.O. Box 1198
Ada, OK 74820
CML (405) 332-8800
FTS 8-743-2224

ORD Key Contacts

	Telephone		Telephone
Abbott, Jim	CML (919) 541-3443 FTS 8-629-3443	Cordle, Steven	CML (202) 382-5940 FTS 8-382-5940
Akland, Gerald	CML (919) 541-2346 FTS 8-629-2346	Cortesi, Roger	CML (202) 382-5750 FTS 8-382-5750
Barnes, H. M.	CML (919) 541-2184 FTS 8-629-2184	Costa, Charles	CML (702) 798-2305 FTS 8-545-2305
Bates, Ed	CML (513) 569-7774 FTS 8-684-7774	Craig, Alfred B.	CML (919) 541-2821 FTS 8-629-2821
Baugh, Thomas	CML (202) 382-5776 FTS 8-382-5776	Cupitt, Larry	CML (919) 541-2878 FTS 8-629-2878
Berg, David	CML (202) 382-5747 FTS 8-382-5747	Daniel, Bernie	CML (513) 569-7411 FTS 8-684-7411
Bishop, Fred	CML (513) 569-7629 FTS 8-684-7629	Dellarco, Michael	CML (202) 382-5794 FTS 8-382-5794
Black, Frank	CML (919) 541-3037 FTS 8-629-3037	Dempsey, Clyde	CML (513) 569-7504 FTS 8-684-7504
Blacker, Stanley	CML (202) 382-5763 FTS 8-382-5763	DeRosa, Christopher	CML (513) 569-7531 FTS 8-684-7531
Bloch, Marvin W.	CML (202) 382-5776 FTS 8-382-5776	DeRosiers, Paul	CML (202) 382-5747 FTS 8-382-5747
Booth, Robert	CML (513) 569-7301 FTS 8-684-7301	Dial, Clyde	CML (513) 569-7528 FTS 8-684-7528
Bradow, Ron	CML (919) 541-5179 FTS 8-629-5179	Dick, Marshall	CML (202) 382-2583 FTS 8-382-2583
Bromberg, Steve	CML (919) 541-2919 FTS 8-629-2919	Dickerson, Richard	CML (919) 541-2909 FTS 8-629-2909
Brunner, Carl	CML (513) 569-7655 FTS 8-684-7655	Dimitriades, Basil	CML (919) 541-2706 FTS 8-629-2706
Burckle, John	CML (513) 569-7506 FTS 8-684-7506	Donaldson, William	CML (404) 546-3184 FTS 8-250-3184
Clark, Thomas A.	CML (513) 569-7301 FTS 8-684-7301	Duke, Tom	CML (904) 932-5311 FTS 8-686-9011
Clements, John	CML (919) 541-2188 FTS 8-629-2188	Durham, Jack	CML (919) 541-2183 FTS 8-629-2183
Condie, Lyman	CML (513) 569-7211 FTS 8-684-7211	Durham, William F.	CML (919) 541-2909 FTS 8-629-2909
Convery, John	CML (513) 569-7601 FTS 8-684-7601	Eaton, John	CML (218) 720-5557 FTS 8-780-5557
Cook, Don	CML (202) 382-5982 FTS 8-382-5982	Ehrlich, Alan	CML (202) 382-7323 FTS 8-382-7323
Cook, Philip M.	CML (218) 720-5572 FTS 8-780-5572	Ellison, Alfred	CML (919) 541-2191 FTS 8-629-2191

	Telephone
Enos, Henry F.	CML (904) 932-5311 FTS 8-686-9011
Erinoff, Lynda	CML (202) 382-5895 FTS 8-382-5895
Farland, William	CML (202) 382-5898 FTS 8-382-5898
Farrell, Joseph	CML (513) 569-7645 FTS 8-684-7645
Graham, Judith	CML (919) 541-2281 FTS 8-629-2281
Grant, Lester	CML (919) 541-4173 FTS 8-629-4173
Hall, Robert E.	CML (919) 541-2477 FTS 8-629-2477
Hangebrauck, R. P.	CML (919) 541-4134 FTS 8-629-4134
Hill, Ronald D.	CML (513) 569-7861 FTS 8-684-7861
Hood, Ken	CML (202) 382-5967 FTS 8-382-5967
Jakobson, Kurt	CML (202) 382-5748 FTS 8-382-5748
Janetos, Anthony	CML (202) 382-5791 FTS 8-382-5791
Jaworski, Norbert A.	CML (401) 782-3001 FTS 8-838-6001
Jones, Julian	CML (919) 541-2489 FTS 8-629-2489
Keeler, George	CML (405) 332-8800 FTS 8-743-2212
Keith, William	CML (202) 382-5716 FTS 8-382-5716
Kibby, Harold	CML (503) 757-4625 FTS 8-420-4625
Klee, Al	CML (513) 569-7493 FTS 8-684-7493
Kleffman, David	CML (202) 382-5895 FTS 8-382-5895
Knapp, Kenneth	CML (919) 541-3085 FTS 8-629-3085
Koutsandreas, John	CML (202) 382-5789 FTS 8-382-5789
Kreissl, James	CML (513) 569-7611 FTS 8-684-7611
Krishnan, Bala	CML (202) 382-2583 FTS 8-382-2583
Kuroda, Donna	CML (202) 382-5893 FTS 8-382-5893
Kutz, Frederick W.	CML (202) 382-5967 FTS 8-382-5967
Lackey, Robert A.	CML (503) 757-4806 FTS 8-420-4806
Laurie, Vernon	CML (202) 382-5795 FTS 8-382-5795
Laveille, Will C.	CML (202) 382-5990 FTS 8-382-5990
Levinson, Barbara	CML (202) 382-5983 FTS 8-382-5983
Lichtenberg, James	CML (513) 569-7306 FTS 8-684-7306
Lindsey, Alford	CML (202) 382-4073 FTS 8-382-4073
Linthurst, Rick A.	CML (919) 541-4048 FTS 8-629-4048
Lipka, Douglas	CML (202) 382-5940 FTS 8-382-5940
Logsdon, Gary	CML (513) 569-7345 FTS 8-684-7345
Lykins, Ben	CML (513) 569-7460 FTS 8-684-7460
Malanchuk, John L.	CML (202) 382-5948 FTS 8-382-5948
Maxwell, Michael	CML (919) 541-3091 FTS 8-629-3091
McCarthy, Bill	CML (202) 382-2605 FTS 8-382-2605
McCarty, James C.	CML (503) 757-4601 FTS 8-420-4601
McElroy, James L.	CML (702) 798-2361 FTS 8-545-2361
Mitchell, Charles	CML (202) 382-5895 FTS 8-382-5895
Mitchum, R. K.	CML (702) 798-2103 FTS 8-545-2103

	Telephone
Mullin, Cynthia	CML (513) 569-7523 FTS 8-684-7523
Murphy, Thomas A.	CML (503) 757-4601 FTS 8-420-4601
Oppelt, E.	CML (513) 569-7696 FTS 8-684-7696
Ott, Wayne	CML (202) 382-5793 FTS 8-382-5793
Parish, Rod	CML (904) 932-5311 FTS 8-686-9011
Pashayan, Deran	CML (202) 475-8936 FTS 8-475-8936
Paur, Dick	CML (919) 541-3131 FTS 8-629-3131
Pearson, Gareth	CML (702) 798-2203 FTS 8-545-2203
Peterson, Spencer	CML (503) 757-4605 FTS 8-420-4605
Phillips, Richard	CML (919) 541-2771 FTS 8-629-2771
Plost, Charles	CML (202) 382-5796 FTS 8-382-5796
Plyler, Everett	CML (919) 541-2918 FTS 8-629-2918
Puzak, John	CML (919) 541-2106 FTS 8-629-2106
Rhodes, William	CML (919) 541-2853 FTS 8-629-2853
Rossman, Lewis	CML (513) 569-7603 FTS 8-684-7603
Royer, Michael	CML (201) 340-6633 FTS 8-340-6633
Russo, Rosemarie C.	CML (404) 546-3134 FTS 8-250-3134
Schomaker, Norbert	CML (513) 569-7871 FTS 8-684-7871
Schonbrod, Robert	CML (702) 798-2100 FTS 8-545-2229
Sexton, Ken	CML (202) 382-5900 FTS 8-382-5900
Shapiro, Paul	CML (202) 382-2583 FTS 8-382-2583
Snelling, Robert	CML (702) 798-2525 FTS 8-545-2525
Sorg, Tom	CML (513) 569-7370 FTS 8-684-7370
Spence, John	CML (919) 541-2649 FTS 8-629-2649
Stevens, Al	CML (513) 569-7342 FTS 8-684-7342
Swank, Robert	CML (404) 546-3134 FTS 8-250-3134
Talbot, W. Wade	CML (202) 382-5895 FTS 8-382-5895
Tang, Don	CML (202) 382-2621 FTS 8-382-2621
Thacker, Ray	CML (202) 382-5747 FTS 8-382-5747
Thomas, Nelson	CML (218) 720-5550 FTS 8-780-5550
Tingey, Dave	CML (503) 757-4621 FTS 8-420-4621
Trout, Dennis	CML (202) 382-5991 FTS 8-382-5991
Tucker, W. Gene	CML (919) 541-2746 FTS 8-629-2746
Ulvedal, Frode	CML (202) 382-5893 FTS 8-382-5893
Valcovic, Lawrence	CML (202) 382-7303 FTS 8-382-7303
Veith, Gil	CML (218) 720-5550 FTS 8-780-5550
Wallace, Lance	CML (202) 382-5792 FTS 8-382-5792
Weber, Cornelius	CML (513) 569-7337 FTS 8-684-7337
Wilder, Ira	CML (201) 321-6635 FTS 8-340-6635
Williams, Sam	CML (202) 382-5940 FTS 382-5940
Williamson, Shelly	CML (702) 798-2208 FTS 8-545-2208
Wilmoth, Roger	CML (513) 569-7509 FTS 8-684-7509

	Telephone
Winter, John	CML (513) 569-7325 FTS 8-684-7325
Worlund, John	CML (702) 798-2656 FTS 8-545-2656
Wu, Chieh	CML (202) 382-5940 FTS 382-5940

ORD Regional Contacts

The Office of Research and Development's Regional Services Staff is responsible for planning, coordinating, and reviewing a program to provide inter-communication and assistance on all matters of mutual interest and/or responsibility of the Agency's Regional Offices and the Office of Research and Development.

Finally, for further information regarding EPA technical assistance, or for additional copies of this report, please contact:

Director, Michael L. Mastracci — (202) 382-7667
Regional Services Staff (RD-674)
Washington, DC 20460

Regional Liaison Officers	**Telephone**
Gerald Rausa Regional Services Staff Washington, DC 20460	(202) 382-7667
Morris Altschuler Regional Services Staff Washington, DC 20460	(202) 382-7667

EPA Regional Offices

Region 1	Environmental Protection Agency Room 2203 John F. Kennedy Federal Building Boston, Massachusetts 02203 CML (617) 565-3424 FTS 8-835-3424	Connecticut Maine Massachusetts New Hampshire Rhode Island Vermont
Region 2	Environmental Protection Agency Room 900 26 Federal Plaza New York, New York 10278 (212) 264-2515	New Jersey New York Puerto Rico Virgin Islands
Region 3	Environmental Protection Agency 841 Chestnut St. Philadelphia, Pennsylvania 19107 (215) 597-9370	Delaware District of Columbia Maryland Pennsylvania West Virginia Virginia
Region 4	Environmental Protection Agency 345 Courtland Street, N.E. Atlanta, Georgia 30365 CML (404) 881-2013 FTS 8-257-2013	Alabama Florida Georgia Kentucky Mississippi North Carolina South Carolina Tennessee
Region 5	Environmental Protection Agency 230 S. Dearborn Chicago, Illinois 60604 (312) 353-2073	Illinois Indiana Michigan Minnesota Ohio Wisconsin
Region 6	Environmental Protection Agency 1445 Ross Ave. 12th Floor, Suite 1200 Dallas, Texas 75202 CML (214) 767-2630 FTS 8-729-2630	Arkansas Louisiana New Mexico Oklahoma Texas

Region 7	Environmental Protection Agency 726 Minnesota Avenue Kansas City, Kansas 66101 CML (913) 236-2803 FTS 8-757-2803	Iowa Kansas Missouri Nebraska
Region 8	Environmental Protection Agency 999 18th Street Suite 500 Denver, Colorado 80202-2405 CML (303) 293-1692 FTS 8-564-1692	Colorado Montana North Dakota South Dakota Utah Wyoming
Region 9	Environmental Protection Agency 215 Fremont Street San Francisco, California 94105 CML (415) 974-8083 FTS 8-454-8083	Arizona California Hawaii Nevada
Region 10	Environmental Protection Agency 1200 6th Avenue Seattle, Washington 98101 CML (206) 442-1465 FTS 8-399-1465	Alaska Idaho Washington Oregon